The Electrical Industry's Weekly Magazine

October 21, 1957

Electrical World

Price 50 Cents

A McGraw-Hill Publication

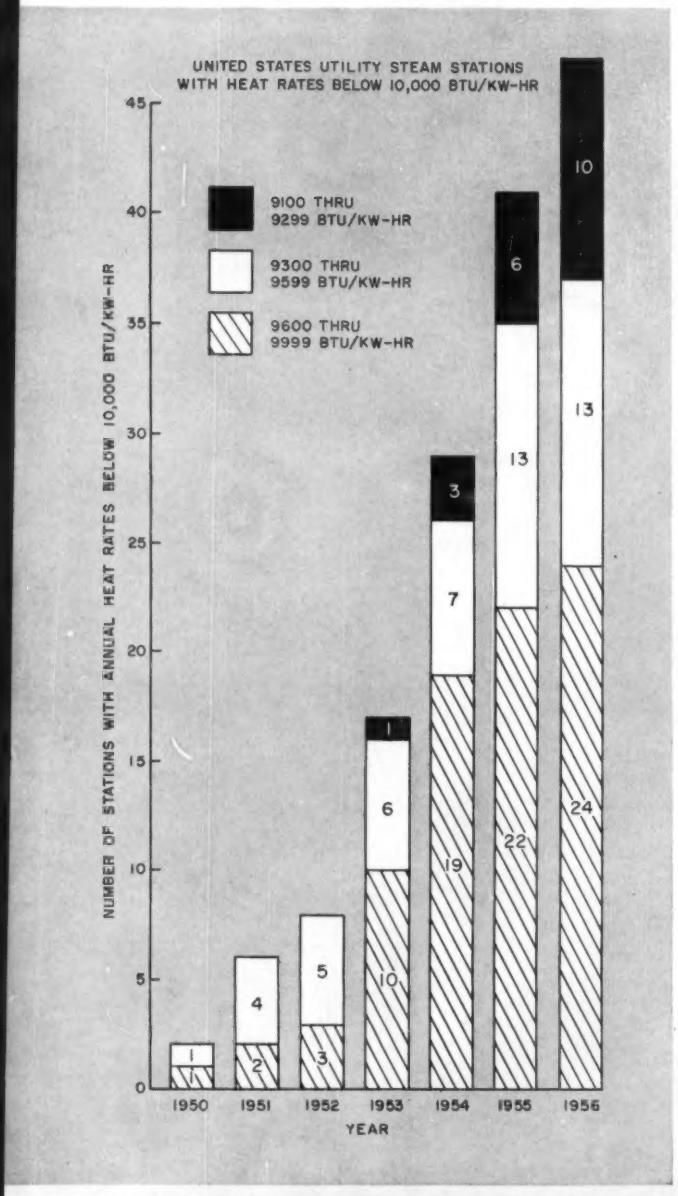
275-Mw Unit Has Low Heat Rate

...Page 50

FINANCING OUTLOOK.....Page 42

E B POWER GS W 12
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH

Latest FPC report shows electric utilities achieving higher steam plant efficiencies



America is getting better steam stations and more of them, according to the latest report of the Federal Power Commission. In 1956, a total of 47 plants passed the traditional yardstick of power plant efficiency—less than 10,000 Btu's per kilowatt-hour. And there were ten stations with a heat rate below 9300 Btu/kw-hr, a heat rate which was first reached in 1953.

This dramatic proof of progress by the industry in boosting system efficiency is a tribute to the way electric utilities co-ordinate the efforts of consultants, manufacturers and suppliers—a co-ordinated effort which is necessary to meet anticipated load economically, thus keeping electricity today's greatest bargain.

Of the 47 "most efficient" steam plants, 39 are equipped with one or more General Electric turbine-generators, and 29 have G-E units exclusively. General Electric also contributes generating units to 9 of the 10 stations topping the list (below 9300 Btu/kw-hr)—7 of the stations are exclusively G.E., and 2 partially G.E.

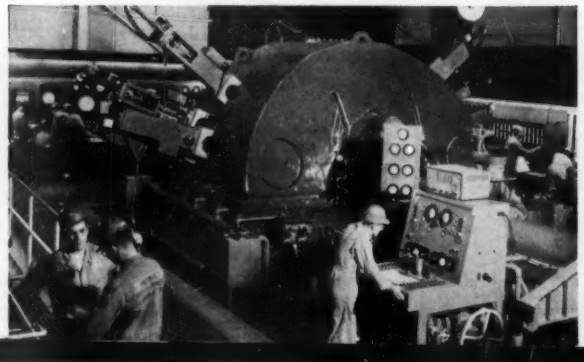
General Electric is proud to be a contributor to this outstanding achievement by the electric utility industry. Through continued, close co-operation with utilities, their consultants, and through a continuing program of research and development, General Electric is preparing to further its contributions to efficient operation. General Electric Company, Section 301–367, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

MORE POWER TO AMERICA

GENERAL ELECTRIC

LATEST FPC REPORT shows total number of "top efficiency" plants is increasing but the number with heat rates of less than 9300 Btu/kw-hr is increasing at an even faster rate—a tribute to the industry's progress in meeting anticipated load with ever-increasing efficiency.



TO HELP UTILITIES achieve even higher power-plant efficiencies, G.E.'s Turbine-Generator Development Laboratory is exploring tomorrow's power generation problems today. Full-scale, low-pressure test turbine, left, is but one of the lab's facilities for testing and evaluating full-size turbine and generator parts under actual operating conditions.

Electrical World

Vol. 148, No. 17 October 21, 1957

Published for 83 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Features

CURRENT EVENTS

Mishap Threatens Nuclear Program

Run-away plutonium pile threatens H-bomb explosion force; nearly brought British civil defense into action.....p 40

Con Ed Revises Atom Plant Design

Indian Point Station will use stainless steel-cladded fuel in oxide form and smaller containment sphere.....p 44

Are You Planning Common Stock Financing

With present high interest rates on funded debt, common offers advantages over debt offerings.....p 42

GENERATION

275-Mw Unit Has Low Heat Rate

Commonwealth Edison's newest unit has 8,885 Btu per kwhr heat rate at 277 Mw, 1 in. mercury back pressure...p 50

INDUSTRIAL

Powers Plant Pumping Station

Underground cables laid as unit in covered trench traverse muddy terrain which raised installation problems.....p 49

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Uses High-Speed Ground Switch

Gas-filled switch will close 20,000 amp in 5 cycles to protect power transformer .....p 56

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Built for a long life of hard knocks, this 4,500-foot, 3-phase, 20kv, shielded Okolite insulated cable with Okoprene sheath powers the rotary cutter head at right. Although nearly 5 inches thick, this cable has all the flexibility needed for dredging operations.

the previous OKONITE cable lasted 15 years ... but this one is built for even better service

Pacific Dredging Company has recently put into service an Okonite replacement for an Okonite 15kv armored cable that had seen fifteen years of successful service . . . two to three times normal expectancy. In the strenuous operation of cables feeding power to giant dredges from shore stations, five years' service life is considered good.

But the new cable was designed to last even longer than its predecessor. The major cause of breakdown in dredging cables has been deterioration of the armor wire, which breaks and punctures the insulation. To overcome this, Okonite engineers replaced the armor with a tough, mold-cured, reinforced Okoprene sheath. Although this construction has only been in operation for a year, Pacific Dredging Company is confident that it will outperform the old one.

This example of Okonite's constant determination to "better the best" shows why Okonite has always been considered a leader in developing and building the finest cables available. Do you have a cable problem? There's a good chance that Okonite engineers have already solved it. Find out today. The Okonite Co., Passaic, N.J.

4349

where there's electrical power . . . there's **OKONITE CABLE**

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. . . from the publisher

Get More Reading Mileage

The man who has a good, up-to-date, broad knowledge of his industry and the general economy has a real advantage when promotion time comes round. With that in mind, here's the third in our series on how to get more reading mileage for your time.

Tip No. 3—Read to get the big picture. Besides gleaning the information immediately useful to you in your own job, you'll want to read about the other fellow's job, too. You may want only to scan these stories, but don't overlook them. They keep you thinking in terms of the whole organization.

You'll find you'll have a better grasp of your own problems when you know what's going in other departments and in other utilities. How many times have you heard a sales boss say wistfully, "Wish I could get our rate men to read this?" And how about the engineer in the field who wishes the design boys had picked up a certain idea.

The man with the industry viewpoint is the man who's acquainted with other people's problems as well as his own. It's to this man that the rewards of bigger responsibilities go.

Fischer Black

ELECTRICAL WORLD

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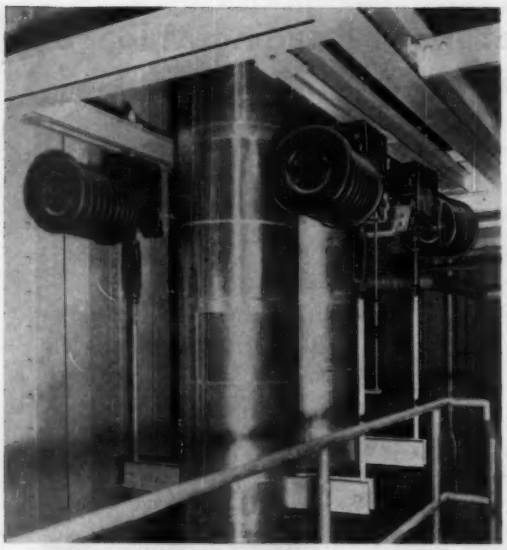
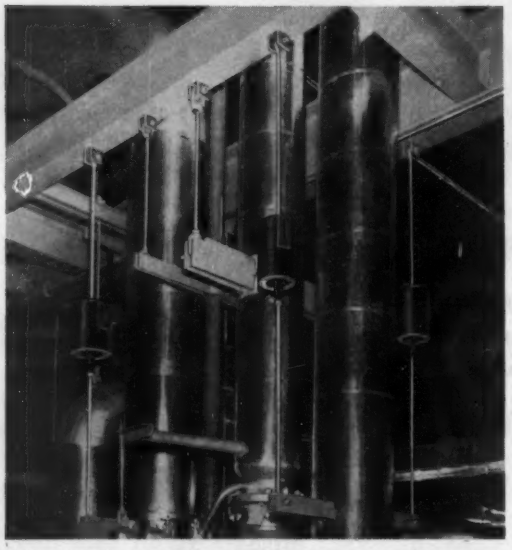
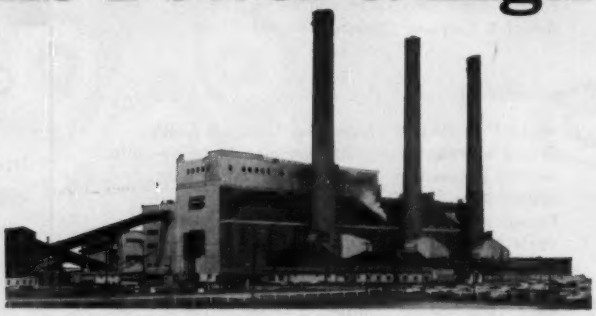
For Indianapolis Power & Light



Grinnell Model R Constant-Support Hangers on cold reheat riser piping. Constancy of support which hangers provide is mathematically perfect for all positions of travel. Note low headroom requirement. Hangers available in sizes for loads ranging from 30 lbs. to 32,260 lbs., with travels up to 12 inches.



Grinnell B-268 Pre-Engineered Spring Hangers on boiler feed piping. Patented precompression feature assures operation of spring within its proper working range. Maximum variation in supporting force per ½" of deflection is 10½% of rated capacity — in all sizes. Available in 21 sizes for loads ranging from 50 lbs. to 28,200 lbs.



H. T. Pritchard Generating Station, Indianapolis Power & Light Company

Pipe Hangers by Grinnell

Six generator units have been built at H. T. Pritchard Station of Indianapolis Power and Light Company since 1947, adding up to a total station capacity of 376,000 kw. In each unit built at this station, just as in every new station constructed by this company, Grinnell Pipe Hangers and Supports have been used exclusively.*

There's good reason why major power companies like Indianapolis Power & Light look to "America's #1 Supplier of Pipe Hangers and Supports." A volume producer of pipe hangers, Grinnell backs up this advantage with an efficient coast-to-coast distribution system of warehouses and jobbers. You can depend on Grinnell for quick deliveries. In fact, even complex hanger requirements often can be met with hanger assemblies right off the shelf. This not only saves you time — but it can save you money, by cutting down on the number of special items which must be manufactured.

Benefit from expert knowledge gained during more than a century of piping experience. On your next piping job, specify Grinnell.

*Work done in collaboration with Gibbs & Hill, Inc., N.Y.C.

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IN OVER 130 PRINCIPAL CITIES

Single-bus arrangement used for auxiliaries at Palatka Station for low cost of supply

Florida Power and Light depends heavily on reliability of Allis-Chalmers switchgear for power continuity of Unit 2

The entire design was based on maximum reliability for a minimum cost of equipment and construction. Outdoor type of construction provided the greatest savings, of course. Keeping the auxiliary supply simple, by using a single bus, also resulted in important savings .

This auxiliary supply scheme places heavy emphasis on the reliability of the Allis-Chalmers switchgear because the entire generating unit is completely dependent on the one bus and one set of switchgear for the essential auxiliary drives.

Start-up power is provided by a tie to Unit 1 auxiliary switchgear bus. A manual synchronized closed-circuit transfer is used during start-up. If generating Unit 2 goes off the line, auxiliaries may be kept in operation by power from Unit 1.

In emergencies, an open-circuit transfer to the reserve source is used, and in this case a voltage decay relay monitors this throwover and permits its completion when residual bus voltage generated by motors has decayed to 25%. Engineers at Florida Power and Light Company found by actual test that a voltage decay of about 75% occurs within 50 cycles.

Structure Mounted Auxiliary Switches

One unusual feature of the switchgear at Palatka is the use of positive acting auxiliary switches on the structure as well as on the breaker. These structure-mounted switches simplify the addition of auxiliary switch contacts and avoid the need of cell switches.

Allis-Chalmers engineers worked in close cooperation with engineers from Ebasco Services, Incorporated and Florida Power and Light Company. This is one of many station auxiliary switchgear lineups built by Allis-Chalmers. For an answer to your switchgear problems, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

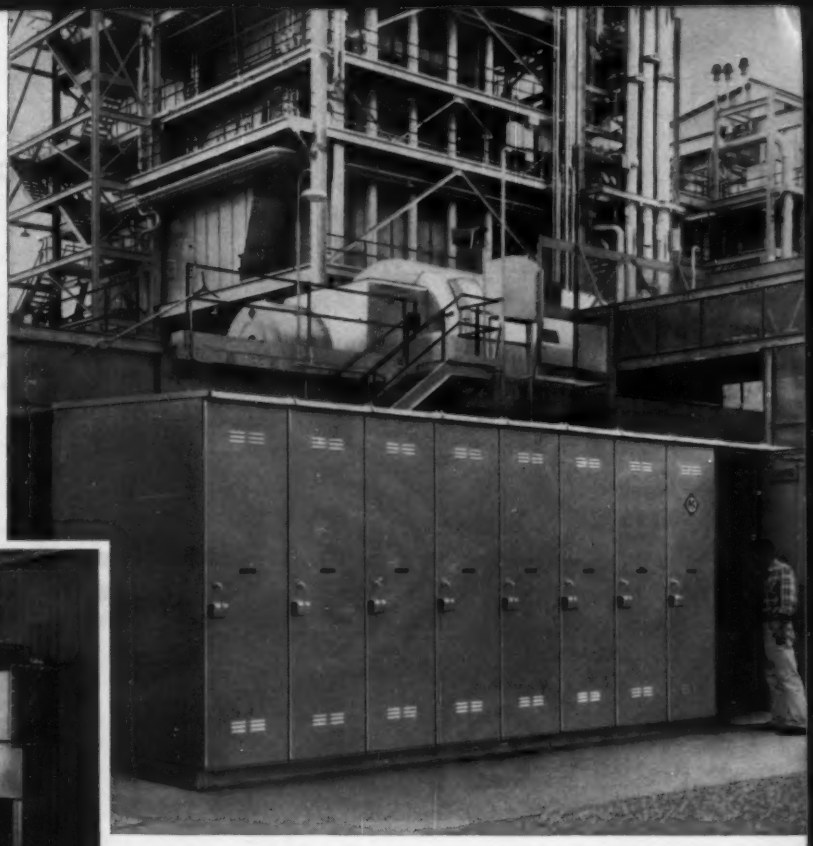
For Progress in Switchgear

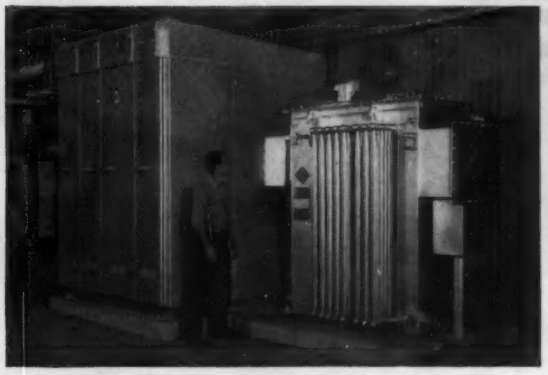
ALLIS-

Palatka Station has an installed capacity of 128,000 kw. Outgoing power is transmitted at 115 kv and 69 kv.

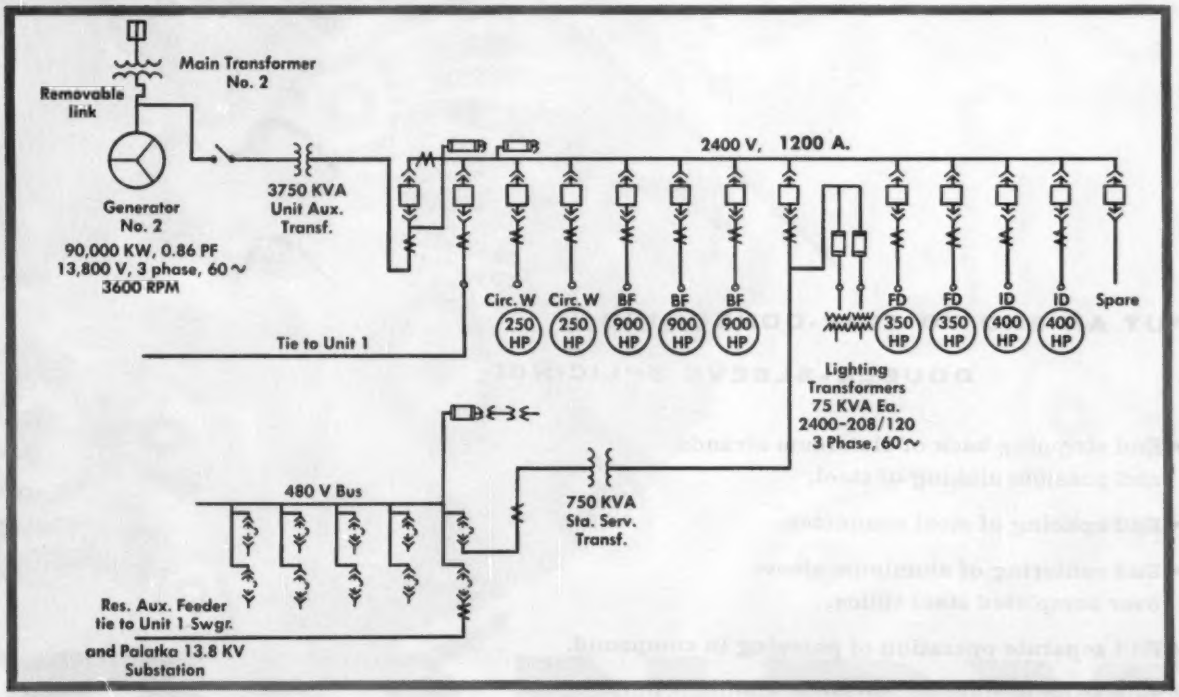
Unit substation type construction was used on both the 2400-volt and 480-volt switchgear to conserve space and provide good appearance.

Allis-Chalmers outdoor-type 480-volt low voltage switchgear is used on circuits for lighting, condensate pumps, lubricating oil pumps, motor control centers and fuel oil boosters.





Ebasco Services, Incorporated, Engineers and Constructors.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Removable link
Generator No. 2
90,000 KW, 0.86 PF
13,800 V, 3 phase, 60~
3600 RPM
3750 KVA Unit Aux. Transf.
2400 V, 1200 A.
Tie to Unit 1
Circ. W 250 HP
Circ. W 250 HP
BF 900 HP
BF 900 HP
BF 900 HP
FD 350 HP
FD 350 HP
ID 400 HP
ID 400 HP
Spare
Lighting Transformers 75 KVA Ea. 2400-208/120 3 Phase, 60~
480 V Bus
750 KVA Sta. Serv. Transf.
Res. Aux. Feeder tie to Unit 1 Swgr. and Palatka 13.8 KV Substation

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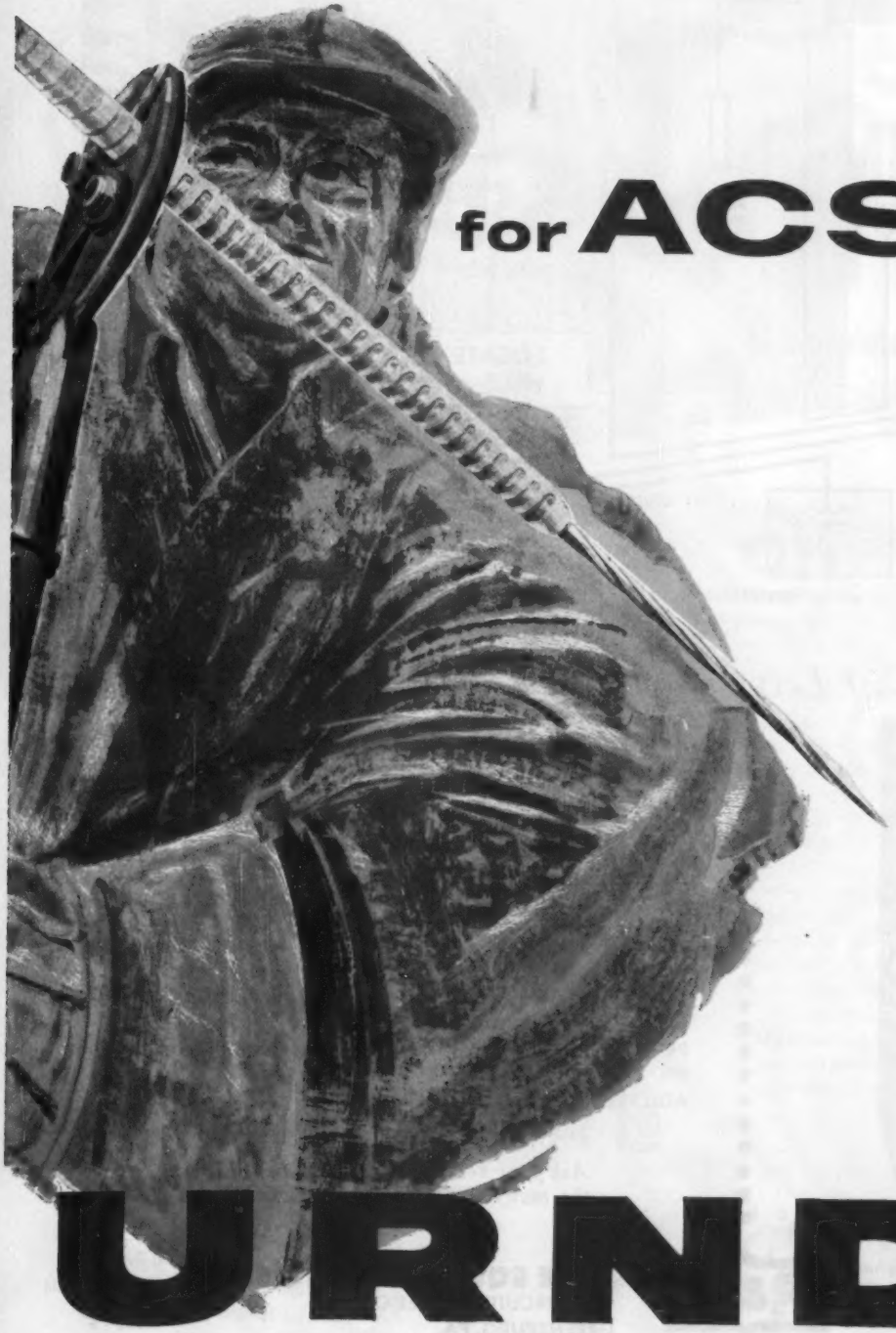
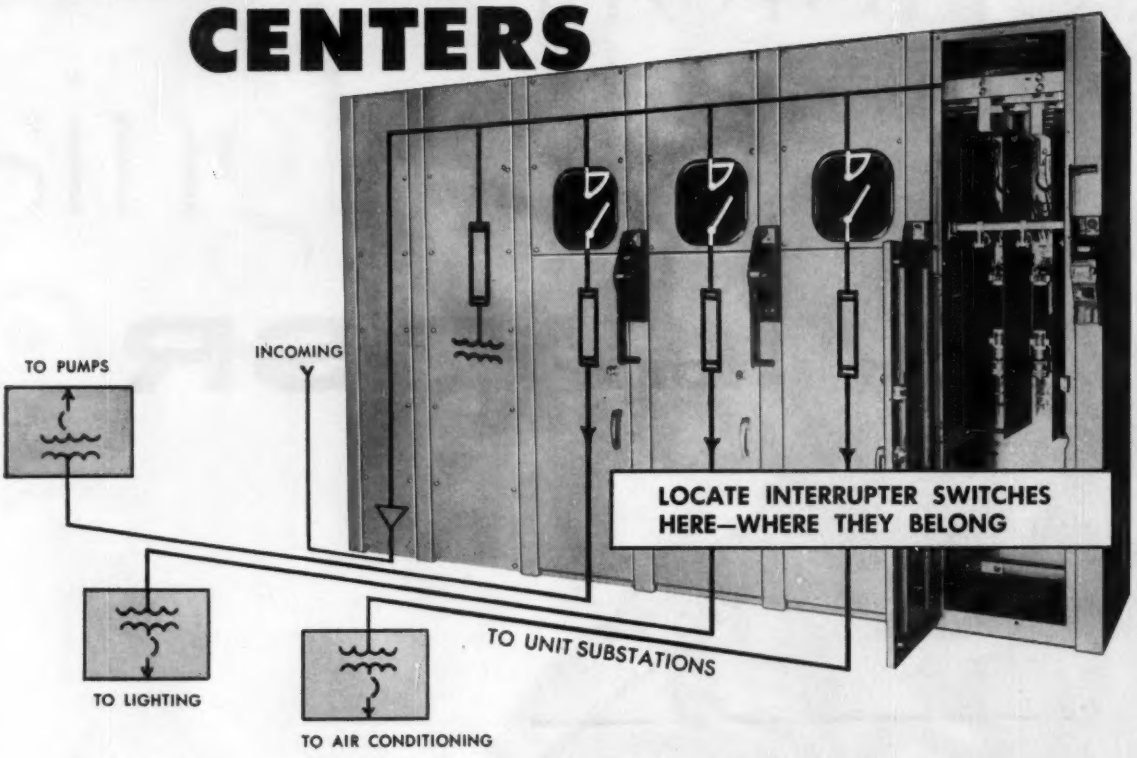


for ACSR

URNDY

R&IE POWER SWITCHING CENTERS



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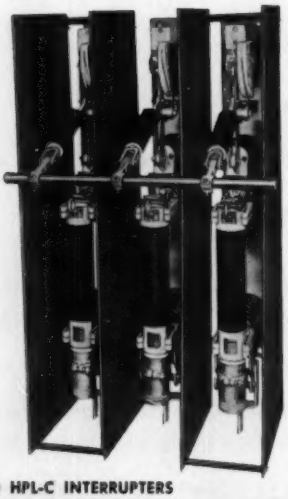

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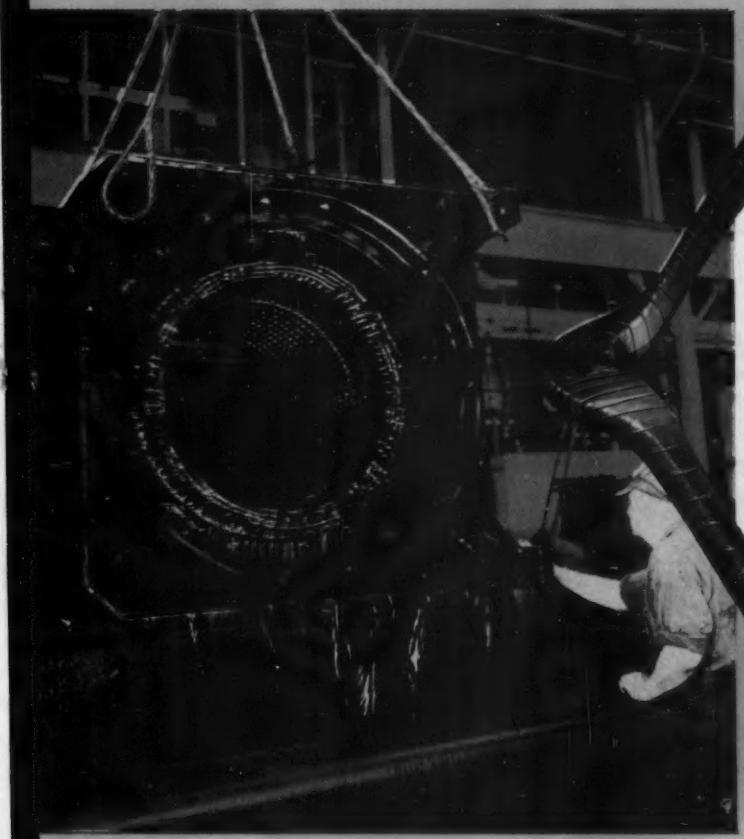
not one insulation failure in 8 years...



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of complete Elliott Stators give insulation "extra" strength

Every step in the fabrication of Elliott large induction motor coils—from coil winding and wrapping to dipping and baking—is carefully controlled to provide maximum protection against electrical or mechanical stresses.

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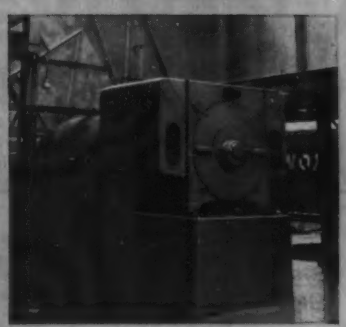
This extra insurance—due to Elliott Fabri-Seal insulation, *and at no extra cost*—has resulted in the unprecedented 8-year operating record. For details, write Elliott Company, Ridgway, Pa.



1,900,000 hp of induction motors in service...

in utilities, oil refineries, chemical plants, shipyards, paper mills... all over the world. And since 1948, not one Elliott stator has failed due to coil insulation breakdown. One of these motors—a 600-hp, weather-protected design—is seen here.

ELLIOTT Company

87-33

FIVE OTHER REASONS WHY ELLIOTT "FABRI-SEAL" INSULATION INSURES LONGER SERVICE LIFE

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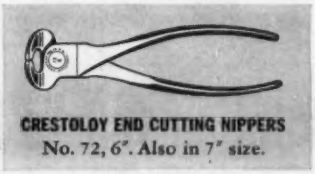
MYLAR*-BACKED MICA SEALS COIL SLOT SECTIONS

*Dupont trademark

SEALED AT ALL VULNERABLE POINTS

VACUUM AND PRESSURE IMPREGNATION

TURN-TO-TURN TESTED AT HIGH SURGE VOLTAGES



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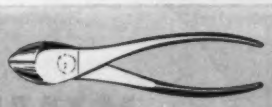

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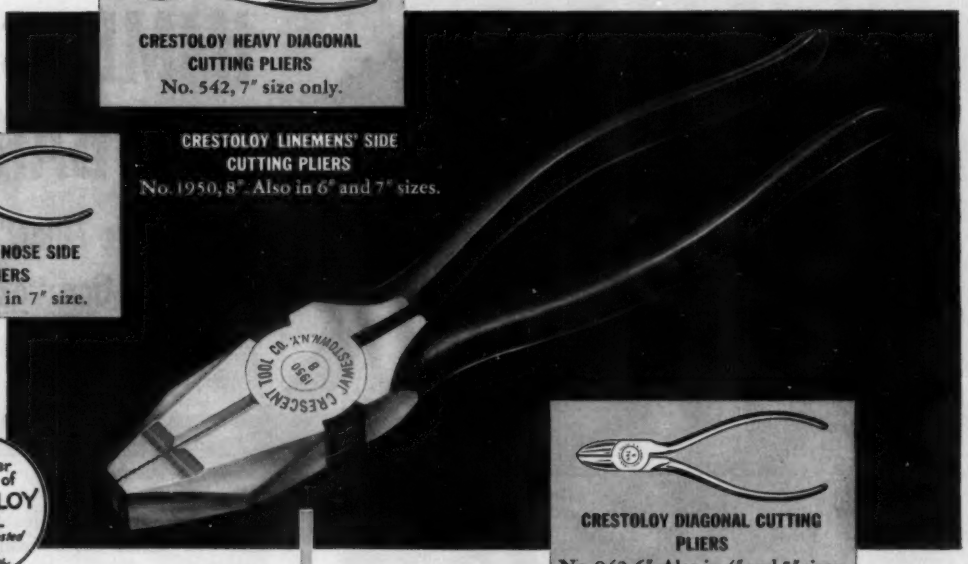

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CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

PENNSYLVANIA MAIN STEP-UP GENERATING STATION TRANSFORMER

Significant savings in installation costs resulted from the upright, one-piece shipment of this large three-phase, main step-up generating station transformer. Such handling was possible because of Pennsylvania's Contour Design, which permitted the manufacture of a unit so compact that only bushings and coolers were removed for shipment.

Designed and manufactured by Pennsylvania for a midwestern utility, the transformer will step up a generated voltage of 15,000 volts to a transmission voltage of 141,000 volts. Two low voltage sections of 15,000 volts are rated at 130,000 kva each. A duplicate unit, for delivery in 1958, has been ordered. Pennsylvania Transformer Division, McGraw-Edison Co., Canonsburg, Pa.

.. by the PIONEER of 1-piece, upright shipment of large power transformers

PENNSYLVANIA POWER TRANSFORMERS

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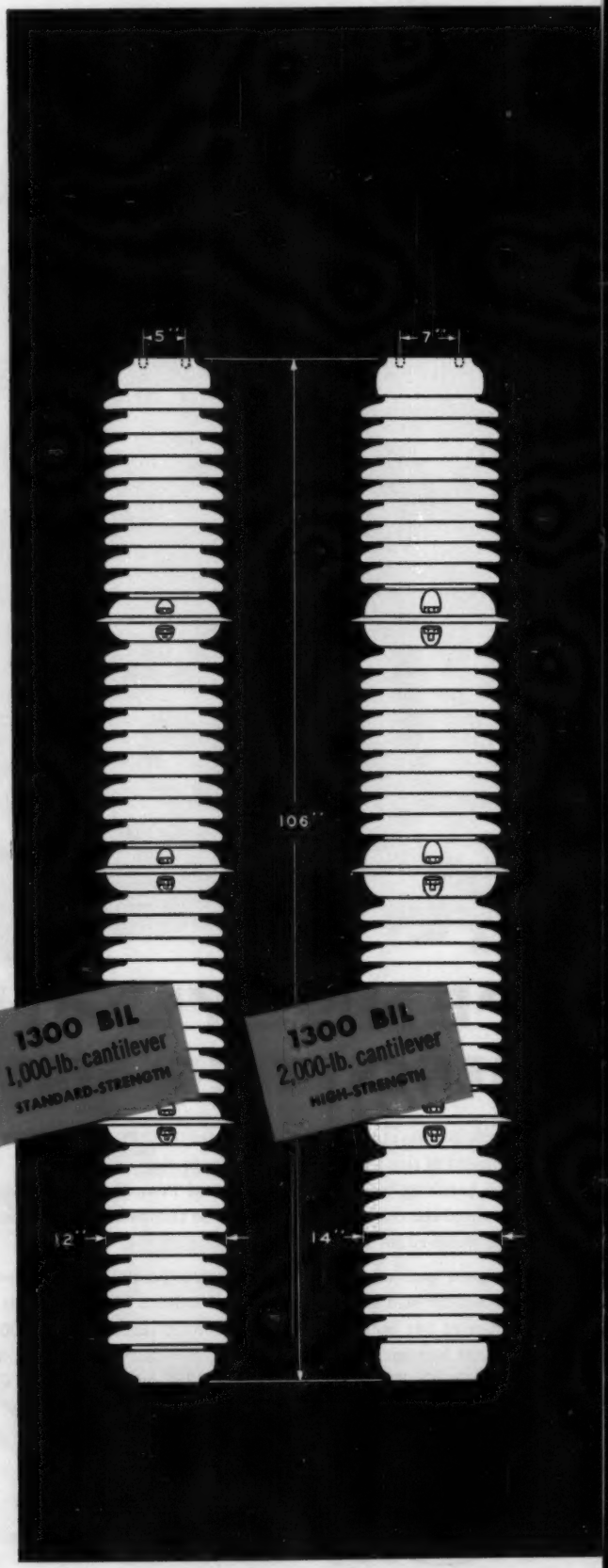
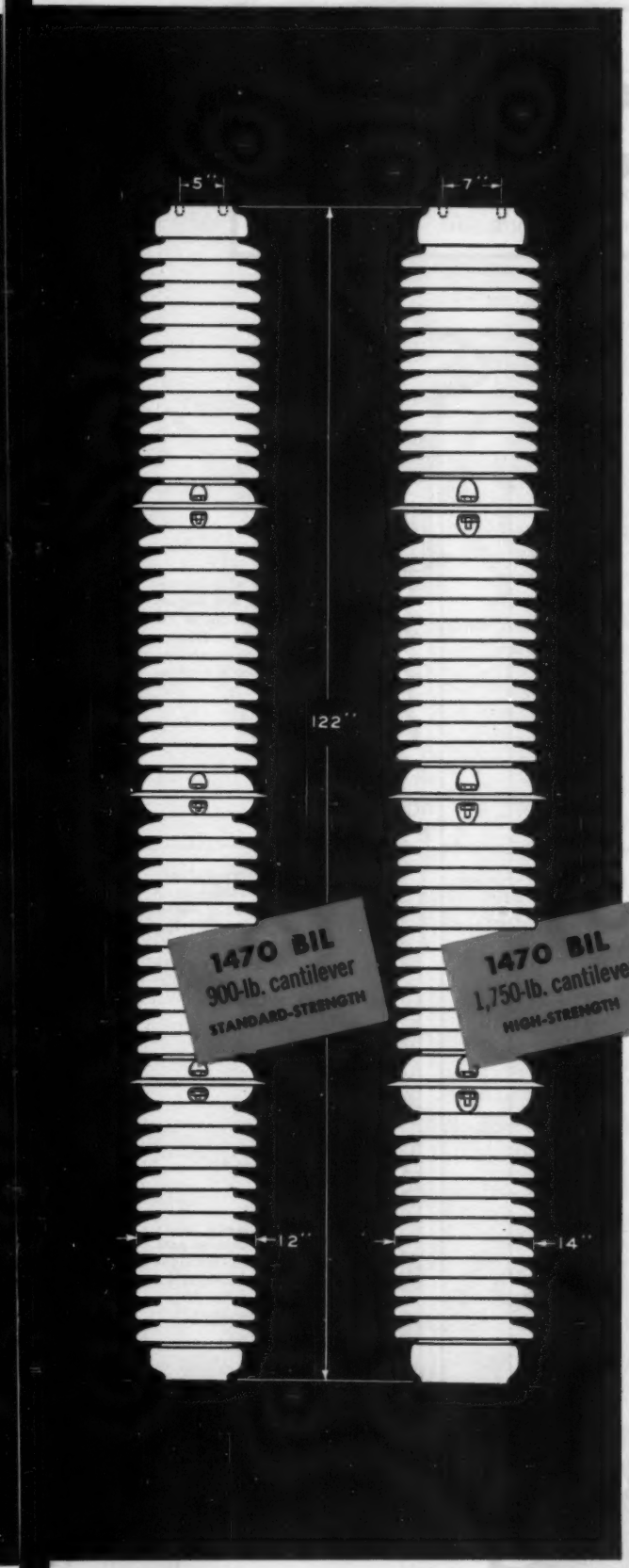
STATION POSTS

FOR EHV

SERVICE





DESIGN FLEXIBILITY... LOWEST COSTS...
GREATER OPERATING SECURITY...
FOR YOUR NEW HIGHEST-VOLTAGE STATIONS

RIGID SUPPORT FOR SWITCHES AND BUS. Deflection at design loads is only one-half as great for standard-strength Lapp Station Posts as for comparable pin-cap insulator stacks. *Positive switch alignment.*

NEW HIGHER STRENGTH. "Standard-Strength" Station Posts match NEMA strength ratings of pin-cap insulator stacks for 1300 and 1470 BIL. The "High-Strength" Lapp Station Posts provide strength (and rigidity) values not offered in any conventional insulator construction. *Maximum design flexibility.*

REDUCE CONSTRUCTION COST. Light weight saves in supporting structure and construction cost. No sub-bases required. Assembled and installed with only 20 bolts. *Faster, more compact, economical construction.*

IMPROVED MECHANICAL AND ELECTRICAL PERFORMANCE. There's a minimum number of cemented joints in a Lapp Station Post—only eight for either the 1300 BIL or 1470 BIL units (as compared with 21 cemented joints for a 1300 BIL or 24 for a 1470 BIL unit of pin-cap design). Furthermore, each cemented joint of the Lapp Post is a large-area low-compression grip which can load porcelain only in compression. *No cracking.* As with all Lapp Station Post insulators fog-type corrugations are self-cleaning in wind and rain. *No cleaning.*

Write for specifications and data.

Lapp

Lapp Insulator Co., Inc., Le Roy, New York

here's a fuse link that clears faults itself

especially needed for high interrupting capacity cutouts at 12 kv and above

In years past, distribution at 4 kv and below was the rule, and the faults were low. The interruption of short-circuit current was relatively easy, not only because the circuit voltage was low but because the maximum duty imposed on a distribution cutout was low enough to permit the use of small bore fuse tubes. And these small bore tubes gave fairly sure circuit interruption over the entire fault current range.

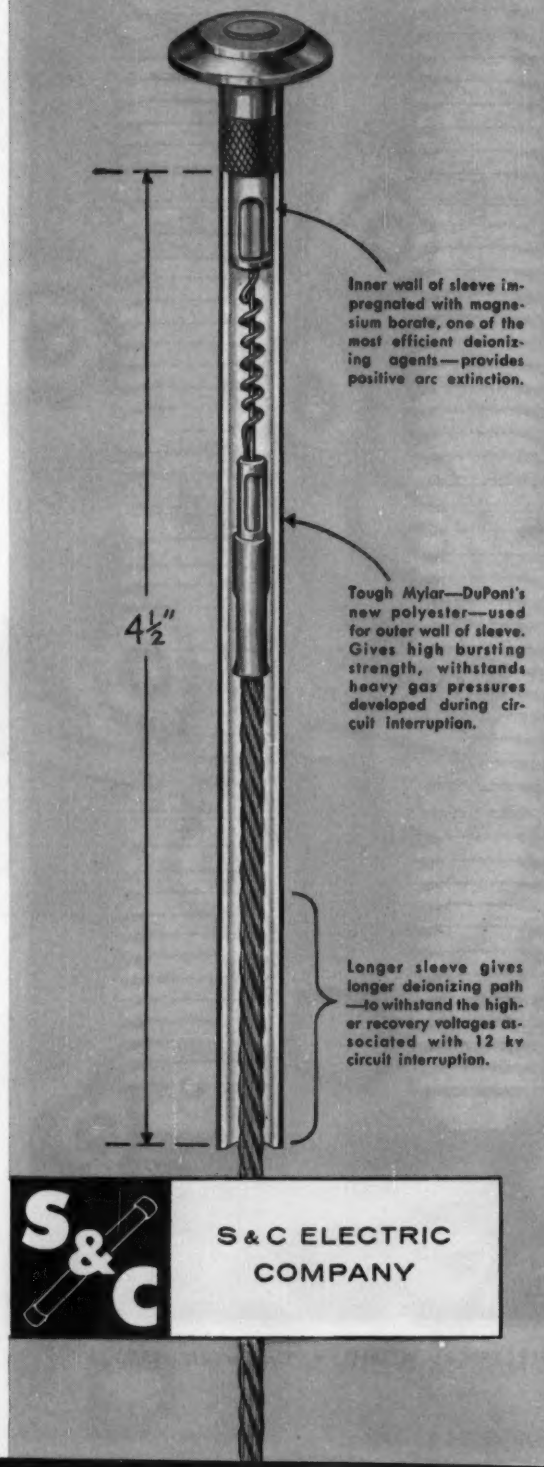
Today, circuit interruption is a lot tougher. Because of the high short-circuit currents, cutout manufacturers have increased, or should increase, the fuse tube bore diameter to minimize blast violence and to retain single-vented operation with its inherently safer *exhaust* behavior. And yet, when fused with conventional fuse links, such large bore cutouts can't reliably interrupt low-to-medium faults.

The result has been that the user has had to choose between: (1) A large bore cutout that couldn't positively clear the lower faults, hence requiring a momentary feeder outage by putting this duty on the back-up recloser and breaker while the cutout dropped open to isolate the fault, or (2) a small bore double-vented cutout that is inherently dangerous.

This new S&C Positrol Fuse Link makes the choice easy and obvious. By itself—and regardless of cutout design—it gives positive interruption of low and intermediate faults. With fault currents of 800 amperes and lower, this S&C Fuse Link acts positively as a dependable interrupting device at 12 kv. The illustration shows why.

Of course, at higher faults, the cutout takes over the interrupting duty.

S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ont.


Inner wall of sleeve impregnated with magnesium borate, one of the most efficient deionizing agents—provides positive arc extinction.
Tough Mylar—DuPont's new polyester—used for outer wall of sleeve. Gives high bursting strength, withstands heavy gas pressures developed during circuit interruption.
4½"
Longer sleeve gives longer deionizing path—to withstand the higher recovery voltages associated with 12 kv circuit interruption.

S&C ELECTRIC COMPANY

NEWS-SCOPE

FUTURE NEWS ▶ **Areas that cannot offer "cheap power"** to aluminum companies nevertheless can look forward to bidding successfully for new plants in the future, provided that the prospect can count on low transportation and labor costs.

It's almost possible to foresee federal steam plants firming up shaky hydroelectric capacity in the Pacific Northwest. Senate Public Works Committee asked the Corps of Engineers to re-examine its plan for developing the Columbia River and tributaries. Among the objects: Restudying "hydroelectric power potentialities as a part of a combined hydro-thermal system."

Good prospect to fill the vacant general counsel post at TVA is John Dugger, U. S. assistant district attorney at Knoxville. Vacancy was caused by the resignation of Joseph Swidler, who bowed out to let "the new board make its own selection of a general counsel."

LATE NEWS ▶ **A way to harness the energy of the hydrogen bomb for peaceful use** has been discovered by Drs Donald Fry and Peter Thonemann, British scientists, claims London's "Daily Express." It added that a scientist at Britain's Harwell Nuclear Labs said H-power for homes and industry "will certainly be available for this generation."

Bureau of Reclamation offers to sell more power to about 300,000 customers in order to supply their growing requirements through 1961. The action affects consumers in the Colorado-Wyoming and western Nebraska area.

British Columbia studies plans for a 3,000-Mw hydro project on the Peace River. A long transmission link to Vancouver, 500 miles away, would be made possible by engineering techniques "that aren't even in the books yet," says Premier W. A. C. Bennett.

"Vociferous enemies" have caused the latest hitch in the Niagara project tangle and may "add millions" to its cost, says Robert Moses, N. Y. Power Authority head. He said Niagara University is asking $9 million for property NYPA is taking, including a school golf course, and that 634 Tuscarora Indians are "whooping it up" on their 6,249-acres, "trying to block our survey parties."

Arkansas Louisiana Gas plans to enter the electric power field by building a 7,500-kw plant next to the new $12.5-million Arkansas Cement Corp plant at Foreman, Ark. J. C. Hamilton, ArkLa president, claims his firm could build more cheaply than the cement plant could obtain power from existing sources and that the cement firm wanted to avoid straining the area's available power sources.

Congratulations . . . Alabama Power Co advances D. D. Wendel from manager of transmission and distribution to vice president . . . Walter B. Gesell joins EEI in new economics post immediately upon retiring as Oklahoma G&E's vice president-operations.

ATOMIC PROGRESS ▶ **A major change has been made in the design of Con Edison's Indian** Point reactor core. Fuel assemblies that were to be made of zirconium will instead be made of stainless steel, which is cheaper to fabricate. The redesigned core, it is expected, will have a life of 660 full-power days without reloading, states James F. Fairman, senior vice president. The company also has abandoned the idea of obtaining access to the sphere for maintenance during operation. This will eliminate part of a biological shield, and will enable the sphere to be shrunk from 190 to 160 ft diam. The plant is to be finished in 1960 **(p 44).**

EVENTS ▶ **Deadly radioactive products spewing over the countryside** from Britain's Windscale plutonium factory created the worst nuclear accident to date. Fast action averted a major disaster when red-hot fuel elements were found in a shut-down reactor. The cause is attributed to some "obscure nuclear mechanism." This mysterious incident may result in modifications to other A-plants and seriously affect Britain's reactor exports **(p 40).**

WASHINGTON ▶ **A plan for developing the Arkansas, White, and Red River Basins** in the Southwest—authorized by Congress in 1950—has been released by the Senate Public Works Committee. It calls for construction of 44 hydro projects having an ultimate planned capacity of 2 million kw. Cost: Over $5 billion. But Bureau of the Budget Director Percival Brundage says the report is mainly an appraisal of potential resources, and a detailed study is needed before any projects are started **(p 41).**

GENERATION ▶ **The world's largest steam-turbine-generator,** a 275-Mw unit, has gone into service at Commonwealth Edison's Will County station. Unit 3 boasts the world's longest last-stage turbine blades—they're 43 inches. It also has outstanding efficiency: Turbine heat rate is 7,325 Btu per kwhr, and overall plant heat rate is 8,885 Btu/kwhr. Steam conditions are 2,000 psi at 1,050F with single reheat to 1,050F. The cross-compound unit uses two furnaces fueled by 64 tangential-type coal nozzles. Cost-cutting features: Furnace has independent air and gas duct systems, which reduce duct work, dampers, and combustion control requirements **(p 50).**

PROTECTION ▶ **A gas-filled, high-voltage grounding switch** has been used successfully to trip remote circuit breakers. Applied to 220-kv duty, the sulfur hexafluoride switch will close 20,000 amp in 5 cycles to protect power transformers against internal faults. Pennsylvania P&L and Westinghouse report this installation was $40,000 cheaper than a more conventional transfer-tripping scheme. Although conventional grounding switches are considered more reliable than transfer schemes, their slow action is a handicap, and they ice easily, further decreasing their speed. The new fast switch uses a reciprocating blade motion. When it operates, it throws a phase-to-ground fault on the system **(p 56).**

PREVIEW OF THIS WEEK'S ELECTRICAL WORLD

MEETINGS ▶ **With reduced generator startup time as the goal,** particular advice for individual machines may replace blanket prewarming recommendations for large 3,600-rpm generator rotors. One company now is studying individual test evaluation methods, and expects to launch field tests soon **(p 48).**

INDUSTRIAL ▶ **To sidestep power failures** (which would throw its well-oiled office routine out of gear), an insurance company provided duplicate power facilities for its new office building. Each of its two 22.9-kv feeders can carry the building's 6,600-kva connected load, and each of a pair of 5,000-kva transformers can handle 75% of the total load. Power is stepped down to a 4.16-kv distribution system in the building's basement, is stepped down again for 277/480 v fluorescent and large-motor loads, and to 120/208 v for incandescent and small motor loads **(p 72).**

FINANCIAL ▶ **Interest rates on new issues of funded debt** of electric utilities have stabilized after a modest improvement during August and September. Uncertainty besets the long-term money market, with possible prospects of a downslide or slump **(p 42).**

The recent nose-dive of common stocks on the New York Stock Exchange has stimulated a switch of investors to the bond market. In particular, tax-exempt bonds of local governments were selling at a "fairly good clip" last week. Leading observer says underwriters now are better able to take on new electric utility financing **(p 101).**

PEOPLE ▶ **Vermont Electric Power Co** has named Byron O. McCoy vice president in charge of operations . . . Pennsylvania Electric Association has elected Joseph O. Chambers president; Chambers is vice president of West Penn Power Co . . . Commonwealth Services, Inc, has promoted Harry H. Fitzgerald and Leonard Milano to vice presidencies . . . Square D Co has elected Lawrence G. Maechtlen first vice president **(p 112).**

MANUFACTURERS ▶ **A 500-kva, vapor-cooled, gas-insulated submersible transformer,** the first to use high dielectric strength gas, has started commercial operation . . . A king-sized, 130,000-sq ft single-shell condenser is riding the rails to the Appalachian Electric Power Co's new Clinch River Plant **(p 91).**

NEW EQUIPMENT ▶ **Loadbreak cutout for extra-heavy duty** now comes in 5.2- and 7.8-kv ratings with current interrupting capacity of 10,000 amp . . . Current transformer tester is rated up to 1,500 amp, and includes precision multirange current transformer for comparison . . . Parallel-groove clamps cover No. 6 through No. 477 Mcm conductors ACSR or all-aluminum conductors in only four sizes **(p 74).**

ENGINEERING TRENDS

A new kind of microwave amplifier, maser (microwave amplification by stimulated emission of radiation) adds very little background noise in the process of amplifying weak signals according to INDUSTRIAL BULLETIN of Arthur D. Little Inc. When used as an oscillator it can be an extremely accurate time standard. It depends on the properties of molcules rather than on electronic processes.

See-saw movement artificial respirator has been developed in Switzerland. It is mounted on a stretcher and is intended for reviving victims of drowning, asphyxiation, or electrocution. Repeated movement of the apparatus helps bring up water, assists breathing, and stimulates blood circulation. It can be handled by one person.

Electricity is being made directly from gases with an efficiency of 65 to 80% at National Carbon Co's Research Laboratory. The method uses a new fuel cell that converts the chemical energy of hydrogen and oxygen directly into electricity. The cell is a container filled with electrolyte in which are immersed two hollow porous, carbon electrodes. They feed oxygen and hydrogen into the cell and conduct electricity from it. An electrochemical reaction at the hydrogen electrode releases electrons that flow through the external circuit and return to the cell at the oxygen electrode. Neither heat nor pressure is required.

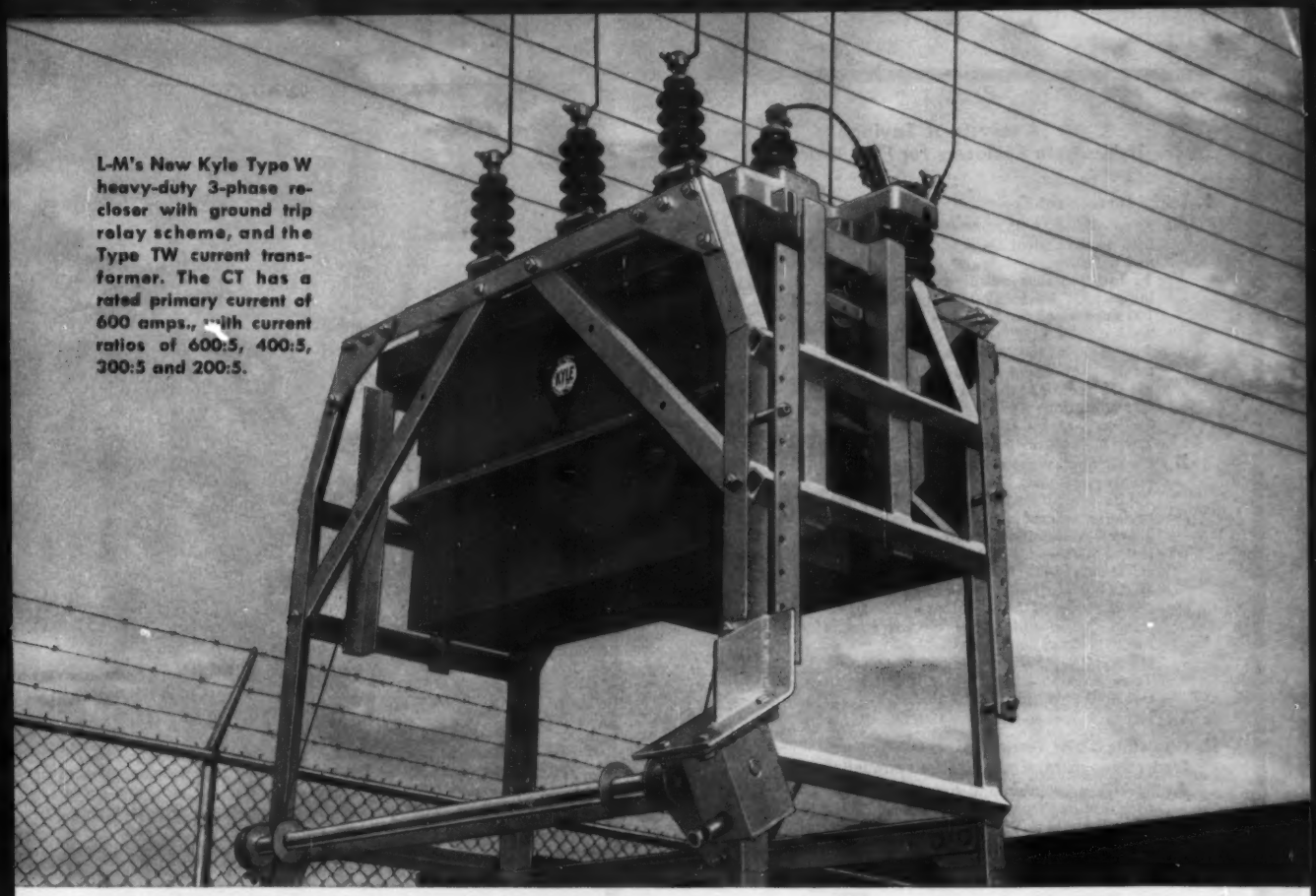
Aluminum for high temperature may be possible as a result of new aluminum powder metallurgy products. Certain of the powder aluminum products can withstand 900F—an advance of 300-400 deg above the point at which conventionally-produced alloys can function properly.

Shortage of pole timber which is suitable for 35 and 40 ft joint-use poles could be alleviated by exploiting savings in loading offered by lighter-weight conductors and pole-mounted equipment. Possible uprating of allowable fiber stresses, particularly for "dense" poles, also offers some relief.

An increasing proportion of electric motors as compared to steam turbines is being used in petroleum refineries. Increase reliability of generating capacity and distribution systems is cited as reason for trend.

FROM EDITORS IN THE FIELD

Bonneville Power Administration's leased computer system now is utilized about 2/3 of available time on engineering problems vs 1/3 on commercial routine. Similarly to most electric utility digital computer systems, BPA's equipment originally was justified for primarily accounting work. But trend toward engineering use predomination has increased steadily.



L-M's New Kyle Type W heavy-duty 3-phase recloser with ground trip relay scheme, and the Type TW current transformer. The CT has a rated primary current of 600 amps., with current ratios of 600:5, 400:5, 300:5 and 200:5.

At Half the Cost of OCB's...

Substation Type W Recloser Gives Greater Protection With Fast 2½-Cycle Clearing

By **FRANK McSTAY**, Product Manager, Kyle Products, Line Material Industries

Now, with L-M's new high-speed Type W Recloser, conductor burn-down of distribution feeder circuits is reduced to a minimum. This completely automatic and self-contained 3-phase unit clears so rapidly that up to 90% of the faults on typical distribution systems are prevented from becoming permanent. In fact, the Kyle Type W clears in less than half the time of distribution oil circuit breakers. This instantaneous opening results in better fuse coordination and helps to confine permanent faults to a small area.

The Type W also offers another advantage: by reducing the length of time during which fault current flows, the recloser permits using larger transformers without increasing the size of the wire on the system, or necessitating reactors to limit the available fault current.

200 MVA for Half the Cost

Besides safeguarding the distribution circuit, the 3-phase Type W offers large savings in both initial investment and maintenance. The unit is approximately half the price of an equivalent OCB for the same application.

Series over-current tripping is utilized with a selection of five time-current characteristics—fast, retarded, or extra retarded—in two degrees of slope—with 2, 3, or 4 operations to lockout, in many combinations of operations. In addition, L-M has a complete line of auxiliary equipment to provide almost any supplementary relaying scheme.

Ratings from 100 to 560 Amps.

L-M's Type W is available in normal load ratings from 100 to 560 amperes, with symmetrical RMS interrupting ratings up to 12,000 amperes at 4.8 kv and below, 10,000 amperes at 8.32 kv and below, and 8,000 amperes up to 14.4 kv. Current ratings can be changed in the field by simply replacing the series trip coils.

Get Complete Information

Ask the L-M Field Engineer for Bulletin CRIW giving more information on how L-M's new Type W recloser can be profitably applied to your system. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

McGRAW EDISON

LINE MATERIAL Industries Kyle® Reclosers

McGRAW-EDISON COMPANY

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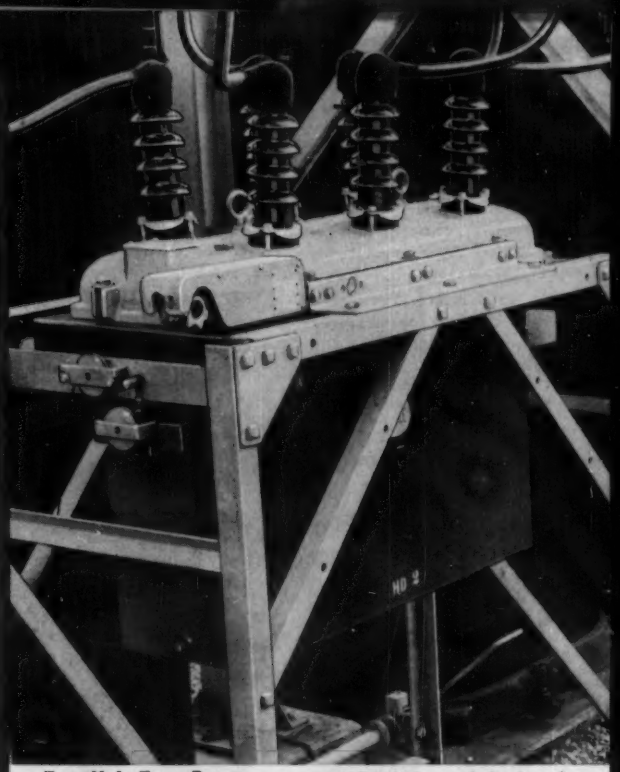
Analysis of Savings Using Kyle Reclosers for Five Years*

	Savings on 100 Substations	
I. Initial Investment Costs		
A. At substation. A Type R OCR as compared with an equivalent OCB with AC tripping and reclosing.		
1. Initial savings in equipment costs favoring each OCR—$3227.00. Total savings for 100 substations for 5 years— 2 x 5 x 100 x $3227/20.....	$161,350.	
2. Initial savings in labor costs to install transformers and wiring necessary to operate OCB—$30 per OCR. Total savings for 100 substations for 5 years— 2 x 5 x 100 x $30/20.....	1,500.	
Total initial investment savings with OCR's		$162,850.
B. On distribution feeders with 5 sectionalizing points per feeder.		
1. Equipment costs of 3 OCR's and 2 sectionalizers exceeding that of 5 fused cutouts = $491. Additional costs to utilize self-protective scheme for 200 feeders for 5 years = 5 x 200 x $491/20.....(—)	$ 24,550.	
2. Labor costs of installations. OCR exceeding that of fused cutout = $15. Additional cost to utilize self-protective scheme for 200 feeders for 5 years = 5 x 200 x $15/20.....(—)	750.	
Total additional costs of OCR's and sectionalizers over fused cutouts.....		— 25,300.
C. Net savings in initial costs with OCR's....		$137,550.
II. Operating Costs (estimated 9 outages per feeder through transient conditions annually)		
A. Savings in frequency and duration of service trips resulting from transient faults		
40 man-hours @ $5/hr. per feeder.	$200.	
25 truck hours @ $1/hr. per feeder	25.	
Cost of fuse links per feeder.....	5.	
Total cost of transient outages per feeder.....	$230.	
Total 5-year cost for 100 substations = 5 x 2 x 100 x $230.....	$230,000.	
B. Increased revenue resulting from reduced outages. 1500 KWH per outages per feeder for 5 years through loss of service @ 2¢ per KWH = 1500 x 2 x 100 x 5 x $.02.....	30,000.	
C. Total savings from transient fault protection for 5-year period.....		$260,000.
III. Maintenance Costs		
A. OCR and sectionalizer maintenance cost @ $25 per unit annually = $25 x 5 x 2 x 100 x 5.....(—)	$125,000.	
B. OCB additional relay calibration costs @ $25 per unit annually = $25 x 2 x 100 x 5.....	25,000.	
C. Total additional costs of OCR and sectionalizer maintenance for 5 years.....		— $100,000.
IV. Carrying charges (conservatively estimated as 10% annually of initial capitalized investment)		
A. At substation. Savings represented by OCR's = ($3227 + $30) x 2 x 100 x 5 x .10.....	$325,700.	
B. On line, additional cost of automatic scheme = ($15 + $491) x 2 x 100 x 5 x .10....(—)	50,600.	
C. Savings in carrying charges with OCR's and sectionalizers.....		$275,100.
V. Subtotal.....		$572,650.
Additional savings resulting from Transient Fault protection		
VI. Savings realized by elimination of conductor and equipment damage through extra-fast clearing on heavy faults.....		$?
VII. Value of improved public relations realized through better continuity of service.....		$?
VIII. TOTAL SAVINGS.....		**Well over half a million dollars!**

**Costs are conservative estimates based on the best available information from utilities. System used to illustrate average installation consisted of 100 substations each with two 15 kv feeders, and amortized in 20 years.*



Two Kyle Type R reclosers are providing high-speed clearing of 13.8 kv feeders for transient fault protection and automatic disconnecting of permanent faults with minimum substation investment.

How Heavy-Duty Substation

The application of Kyle reclosers as the automatic disconnecting device in substations eliminates the relatively high costs of circuit breakers and associated substation equipments. This alone offers savings of a half million dollars or more in five years, based on 200 feeder positions.

Lower Initial Costs

Initial investment in Type R recloser equipment of equivalent rating will result in approximately $3,000 savings per feeder. In addition, field reports indicate that labor for installing Type R reclosers is about 50% of that for circuit breakers. The maintenance cost for reclosers is also lower than for circuit breakers.

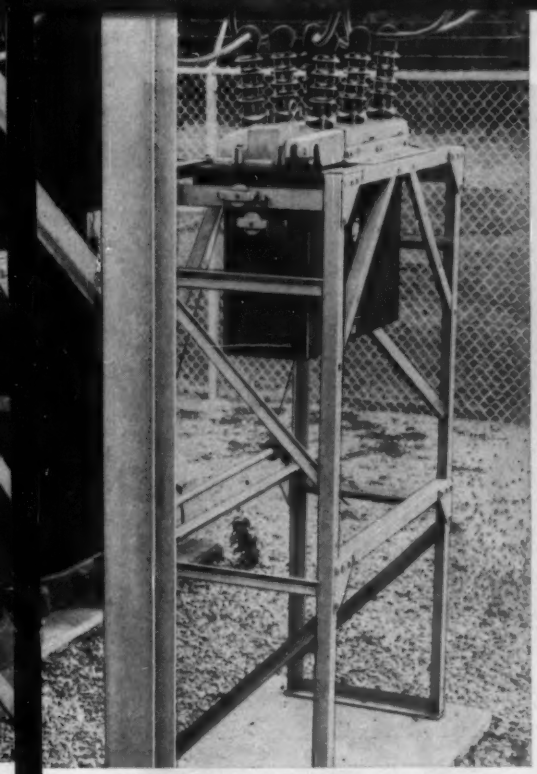
Fewer Outages

L-M Kyle reclosers can also be justified as a fault-protective device that will reduce the number of outages caused by transient or non-persistent causes. Kyle reclosers have extremely fast opening characteristics, clearing circuit in less than 2 cycles, which minimizes conductor burndown and increases service continuity.

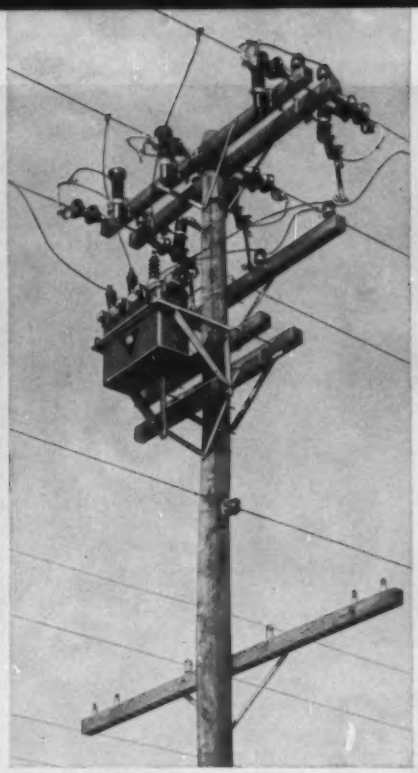
Compare the figures at the left with your construction and operating costs and see how you can save over a half million dollars with Kyle reclosers.

LM **LINE MATERIAL**

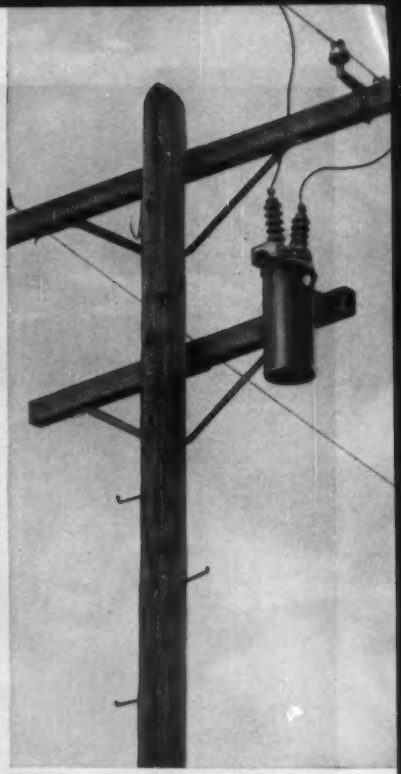
McGRAW-EDISON COMPANY



It is possible to clear over 90 percent of total circuit faults and reduce permanent faults with high-speed Kyle reclosers.



Kyle Type 3H 3-phase reclosers provide coordinated protection on rural lines with up to 1250 amperes at 14.4 kv. Where faults persist, recloser locks open on all 3 phases and confines trouble to a small area.



Kyle Type H single-phase recloser reduces the number of outages on rural lines caused by conductors whipping together on long spans, small branches grounding a conductor, or a lightning discharge.

Kyle Reclosers Reduce Investment And System Operating Costs

L-M high-speed reclosers provide better service continuity and lower operating costs by reducing conductor burndown caused by transient or non-persistent faults on the system. It is possible to clear over 90 percent of total circuit faults and reduce permanent faults with high-speed Kyle reclosers. Such faults are often caused by lightning, arrester flashover, tree limbs shorting the conductors, or conductors whipping together on long spans.

Eliminate the Shaded Area

The shaded area in the chart at right represents the additional fault-clearing ability of L-M high-speed Kyle reclosers. Kyle reclosers clear transient or non-persistent faults on the circuit with no significant damage to the system or interruption of service.

All Kyle reclosers can be coordinated in series to provide complete transient protection over entire distribution system.

Get Complete Information

Ask the L-M Field Engineer for more information on how Kyle reclosers can be profitably applied to your system. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

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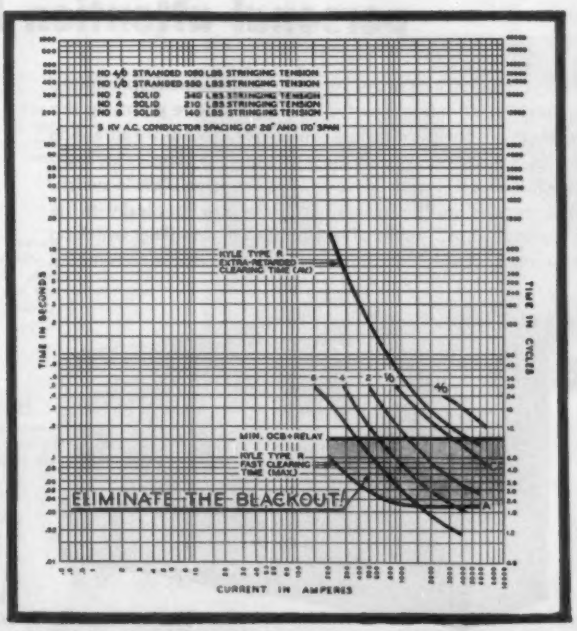
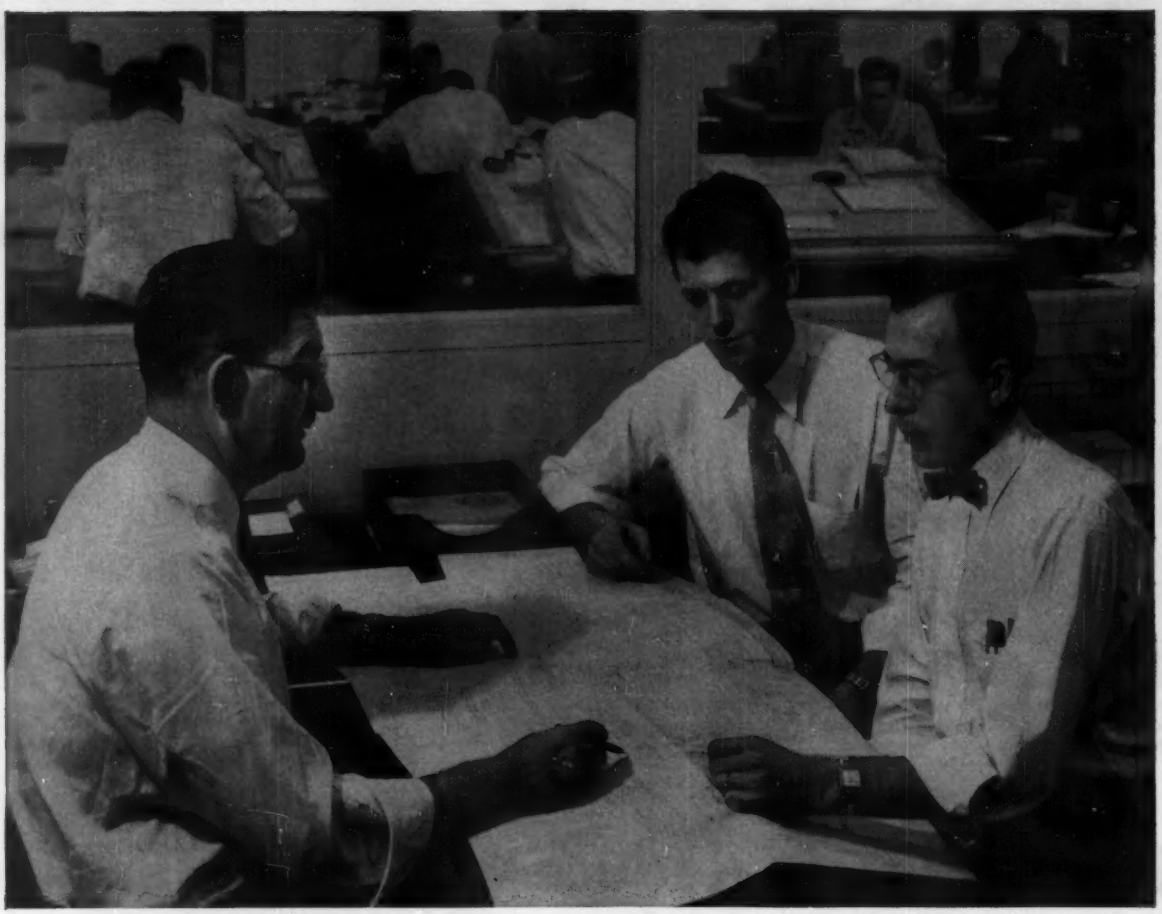

NO 4/0 STRANDED 1080 LBS STRINGING TENSION
NO 1/0 STRANDED 580 LBS STRINGING TENSION
NO 2 SOLID 340 LBS STRINGING TENSION
NO 4 SOLID 210 LBS STRINGING TENSION
NO 6 SOLID 140 LBS STRINGING TENSION
5 KV A.C. CONDUCTOR SPACING OF 28" AND 170' SPAN
KYLE TYPE R EXTRA-DELAYED CLEARING TIME (MAX)
MIN. OCB+RELAY
KYLE TYPE R FAST CLEARING TIME (MAX.)
ELIMINATE THE BLACKOUT
TIME IN SECONDS
TIME IN CYCLES
CURRENT IN AMPERES

Chart shows primary line burndown characteristics for weatherproof wire. It also gives the maximum clearing time for high-speed Kyle reclosers and minimum clearing time for the average circuit breaker plus relay time. The shaded area represents the additional protection that can be obtained with Kyle reclosers in place of circuit breakers.

Kyle® Reclosers



Special switching problems need personal attention by specialized engineers

At 3E your inquiry or order receives *personalized, specialized* engineering attention. The typical scene above points up this fact as plans for a switching center get immediate attention from C. A. Koerner, Vice President and Chief Engineer. Engineers Ray Rueffer and Gene Phillips are specialists in switching center design. Their combined know-how coupled with the 3E Company's 45 years of experience in handling switching problems is focused on this customer's particular requirements.

When planning for unusual conditions ... limited space ... plants with dusty or corrosive atmosphere ... or where you need economy today plus allowance for tomorrow's expansion ... *see 3E.* Our staff of qualified engineers is experienced in handling the unusual ... with a fine record in designing for economy without loss of efficiency or safety. Their facility with standard 3E components designed for maximum flexibility is an asset that is beneficial to our customers.

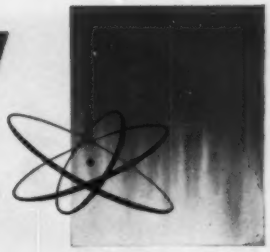
3E Auto Speed load interrupters together with 3E know-how made this 5 bay switching center safe, sure and economical.

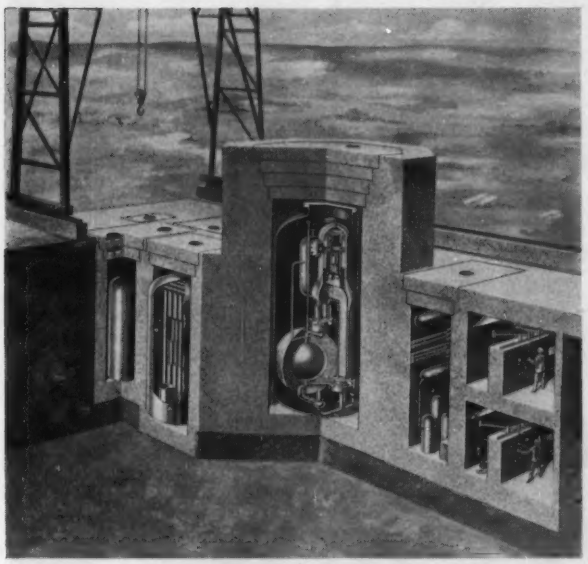
3E

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois
Representatives in principal cities — in Canada by Powerlite Devices, Ltd.

HEAT ENGINEERING by FW

is pioneering tomorrow's LOW-COST ATOMIC POWER





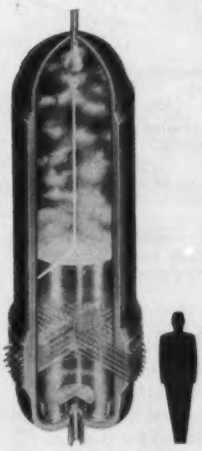
AQUEOUS HOMOGENEOUS BURNER REACTOR

Designed for the low and intermediate power range, the Aqueous Homogeneous Nuclear Power Plant offered by Foster Wheeler has these unique advantages: (1) inherent controlability and self regulation without the use of control rods, (2) minimum mechanical devices and moving parts, (3) continuous fuel addition and fission product removal, and (4) substantial savings in fuel processing costs.

CONVERTING heat from nuclear energy into electric power is heat engineering's newest and most challenging opportunity. From the very beginning, Foster Wheeler engineers have been engaged in development of the nuclear energy program—integrating over 50 years experience in heat-transfer equipment with nuclear engineering.

Working in close cooperation with the Atomic Energy Commission, large utilities and industrial companies, Foster Wheeler has pioneered in the design and development of nuclear reactors and major components for atomic power plants. FW nuclear equipment completed or under construction includes solid fuel tank-type research reactors, steam generators and pressurizers for America's first full-scale atomic power plant, steam generators for the first nuclear powered submarine, reactor vessel and steam generators for shipboard reactor prototype, equipment for test loops for liquid-metal fuel reactor systems, and separately fired superheaters for the first atomic power plant to operate with superheated steam.

With this background, a large staff of highly trained personnel, and the most modern fabricating facilities in three large plants, Foster Wheeler is well fitted to serve in the economical application of nuclear energy.



PRESSURIZER. This 300 cu ft pressurizer, designed and built by Foster Wheeler for America's first full-scale atomic power plant, will be used for initial raising of the coolant system pressure as well as to control pressure during operation. Designed for 2500 psig pressure at 675 F, it is 18 ft high and contains 342 electric immersion heaters.

STEAM GENERATORS. The heat-exchange steam generator during final assembly at a Foster Wheeler Plant, is one of two identical units installed at America's first commercial atomic power plant. Each unit will convert heat from the pressurized water reactor to 600 psia steam for driving the turbo generator.

SEPARATELY FIRED SUPERHEATERS. Two oil-fired superheaters by Foster Wheeler will superheat saturated steam from a pressurized water reactor from 447F to 1000F, at a large Eastern atomic power plant. Each unit has a capacity of 1,075,000 lb/hr at 410 psia. Addition of the superheat cycle raised plant capacity from 163,000 kw to 275,000 kw, reducing plant cost by about $95 per kw.

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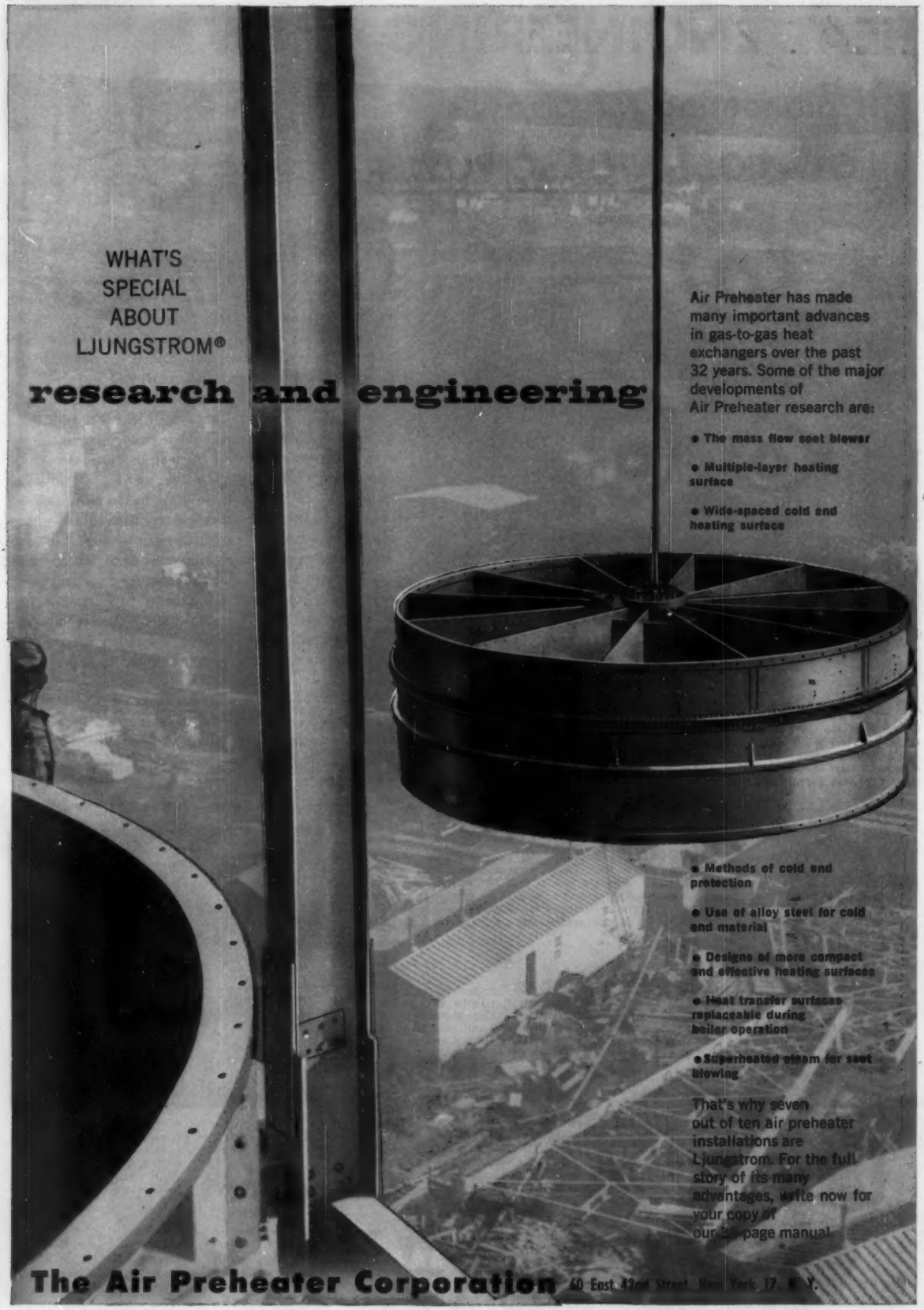
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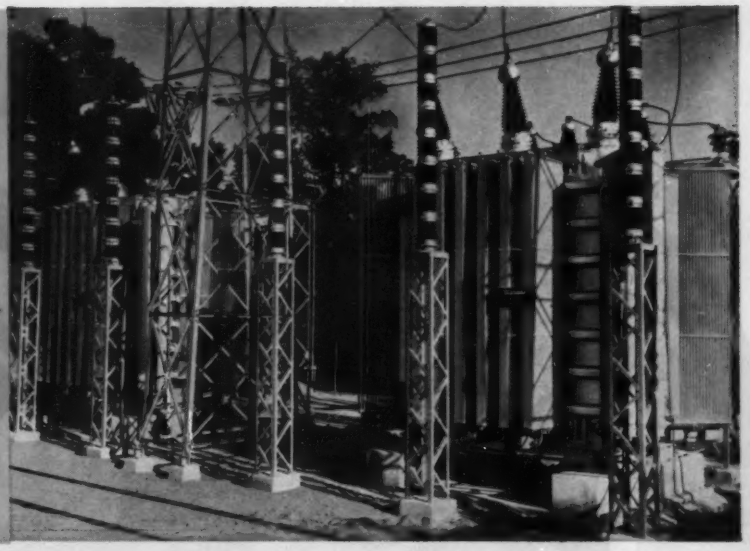

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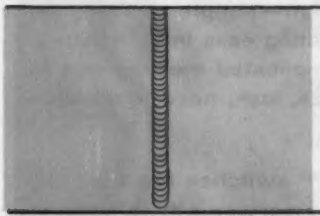

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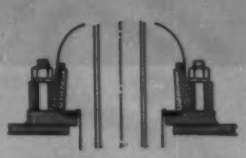
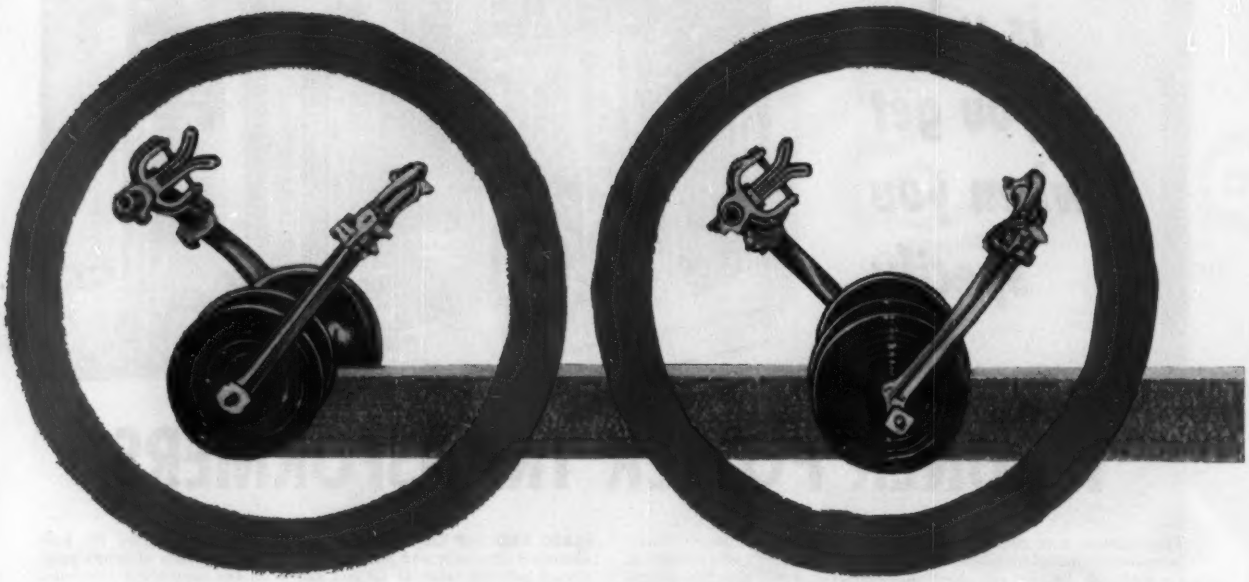
LEAK-PROOF MOUNTING BOSS. For thermometer wells, relay wells and radiator drain plugs. Serrated surfaces make annular grooves in the annealed copper gasket to form leak-proof joint.

VACUUM-PRESSURE BLEEDER VALVE. Has large diameter diaphragms to actuate the valve mechanism when pressure or vacuum inside tank becomes too great. Located on the outside of sealed units for your convenience.

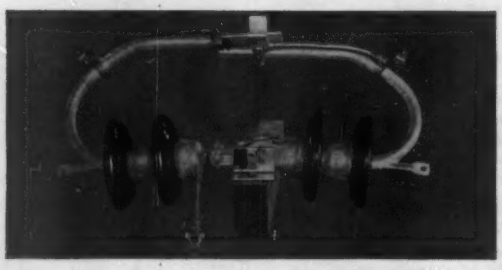
LEAK-PROOF BUSHING JOINT. The gasket is compressed between the porcelain shoulder of the bushing and the tank mounting flange—easy to tighten, simple to replace. Used on transformers with voltages 15 KV and below.



This "look" on a pole



The original "straight-through" airbreak switch—proven in 50 years of system service



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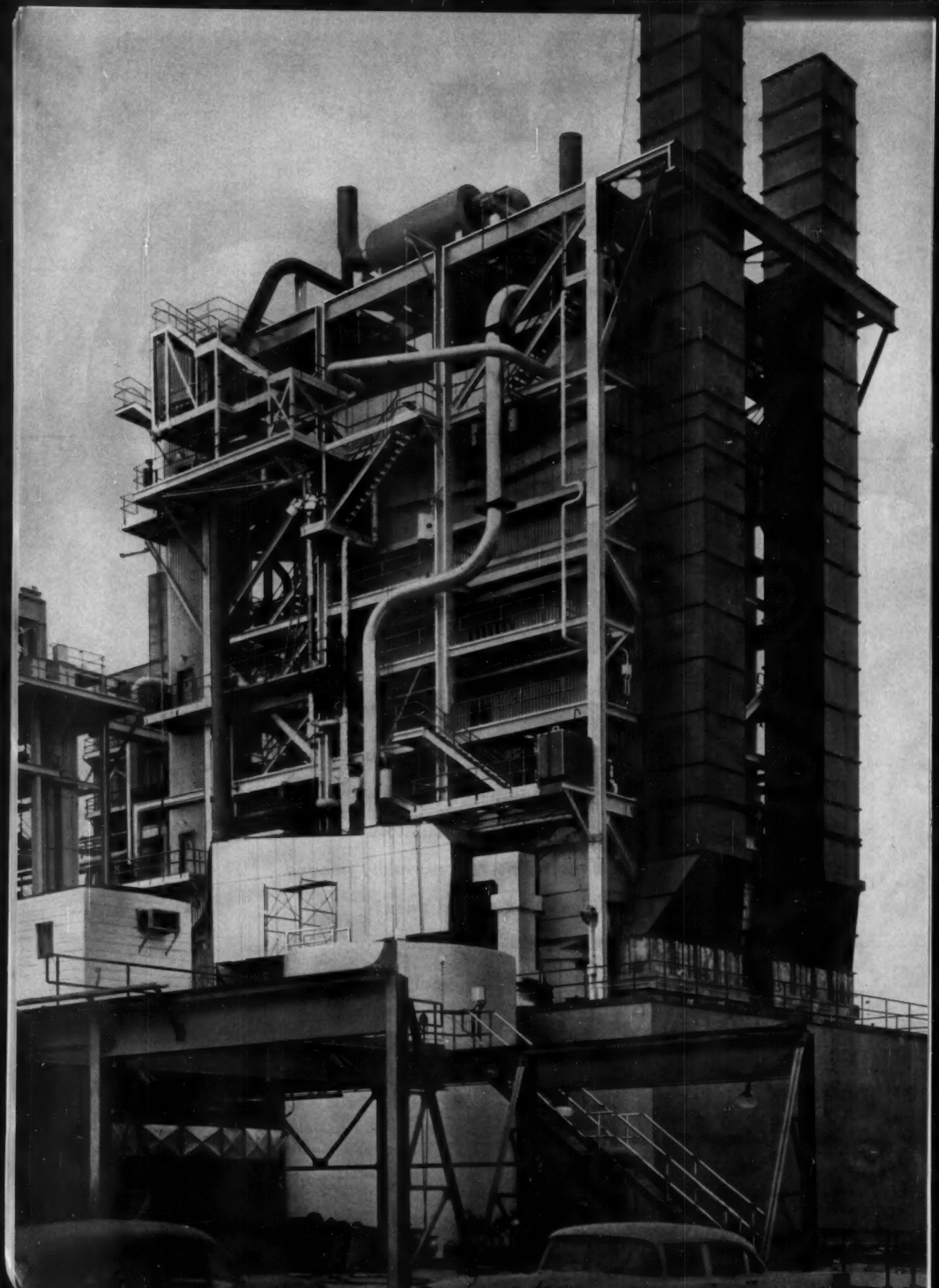
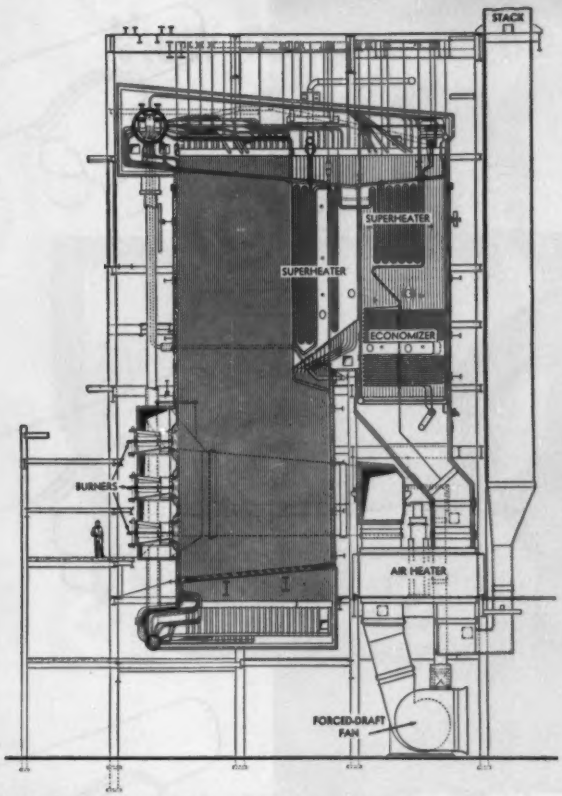
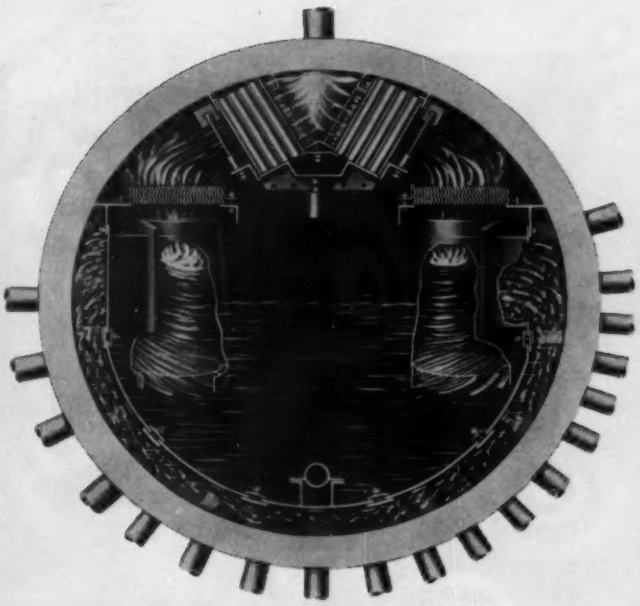




Third B&W Boiler at Parkdale Station of Dallas Power & Light Company has a capacity of 1,050,000 lb of steam per hr at 1550 psi at superheater outlet and 1005 F. Design pressure 1725 psi. Consulting Engineers: Ebasco Services, Inc., New York.



B&W Cyclone Steam Separators help insure clean, dry, high-purity steam output for the turbine, keeping it on the line for longer periods between cleanings.

Another B&W Boiler for Dallas Power & Light Company

Third unit at Parkdale Station with B&W Cyclone Steam Separators provides clean, dry, high purity steam. Provisions in design for future coal firing

A B&W Pressurized-Furnace Boiler, the third at Parkdale Station, has gone on the line for the Dallas Power & Light Company. The latest unit, now fired by gas has design provisions for future addition of a hopper bottom and division wall for coal firing.

B&W Cyclone Steam Separators insure clean, dry, high purity steam output for the turbine. In the original design phase of B&W units, features are included to fit specific needs—and the future needs—of the purchaser. When a unit is designed, provision can be made for alternate systems of firing, depending upon future fuel availabilities. In the new Dallas Power & Light unit, conversion to future coal-firing can be accomplished should conditions in the area so warrant.

National network of B&W plants and engineering facilities provides important advantages. Service and assistance is always near at hand from a nearby link in this chain. Supported by nearly a century of steam generating experience, B&W design, research and development can help you and your engineers with your central station requirements. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

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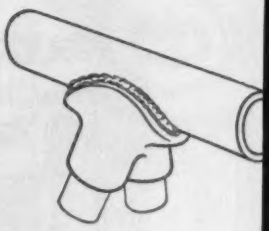

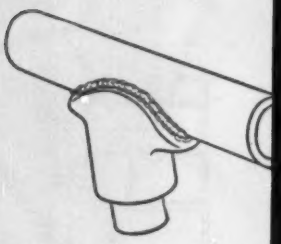

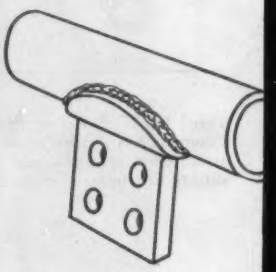

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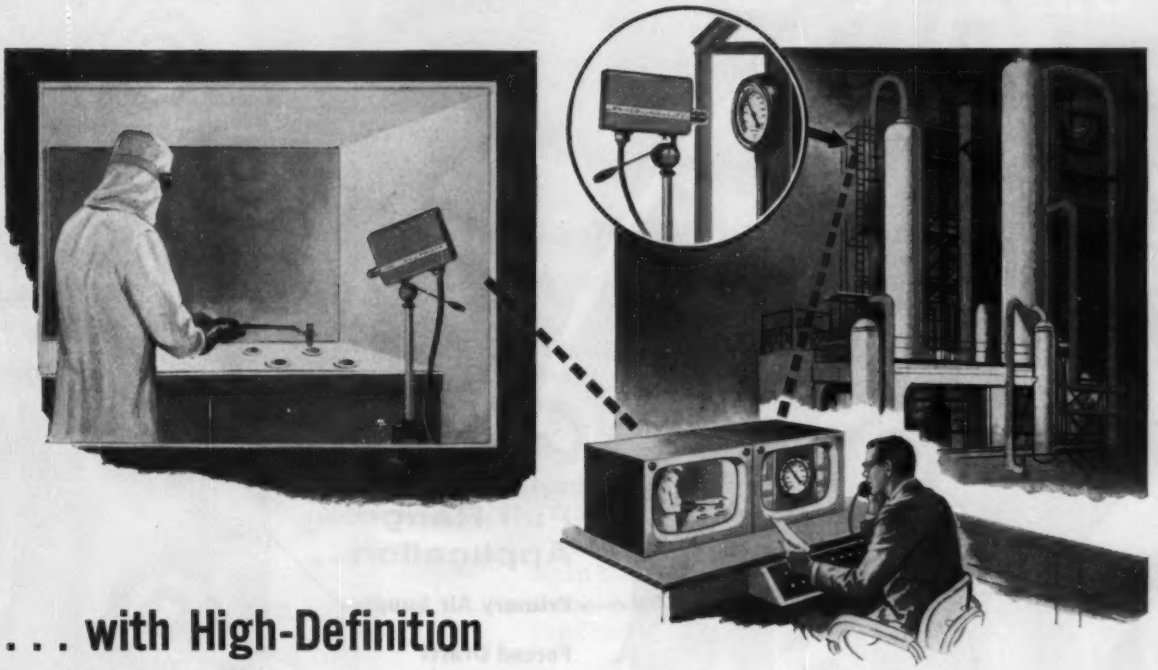

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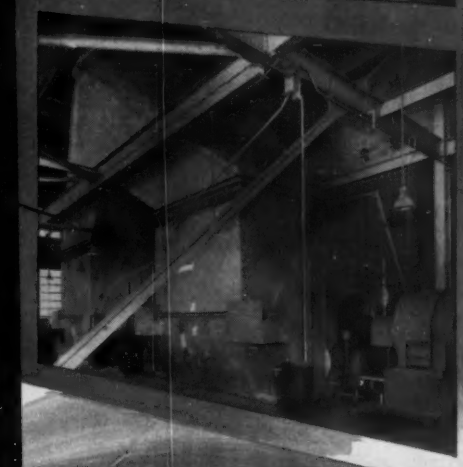

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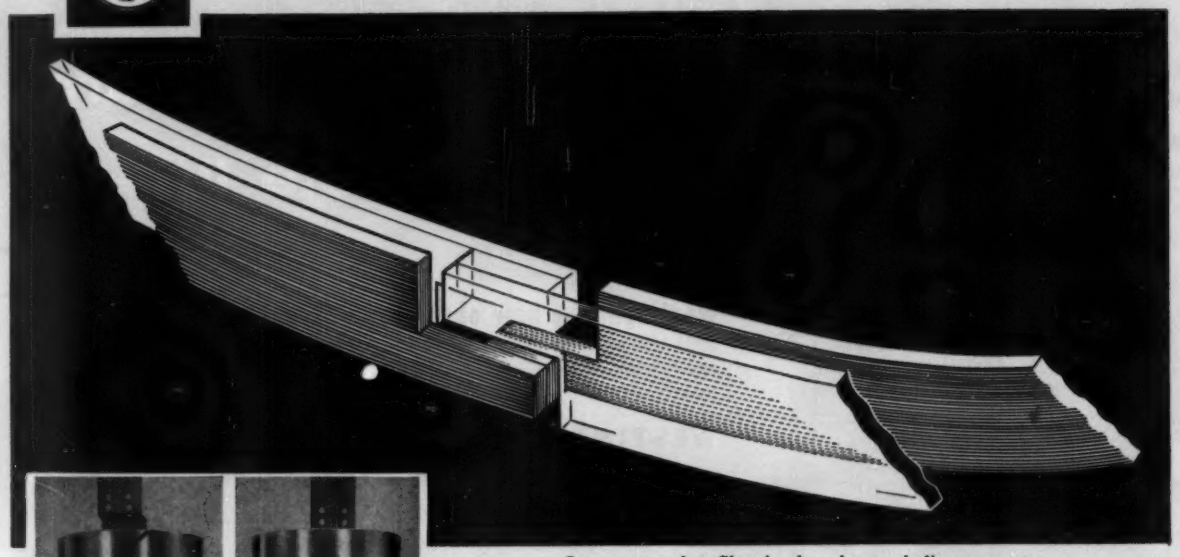
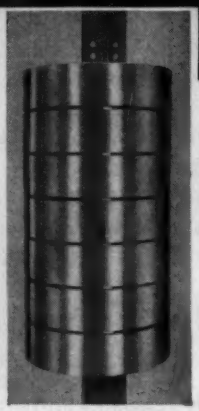


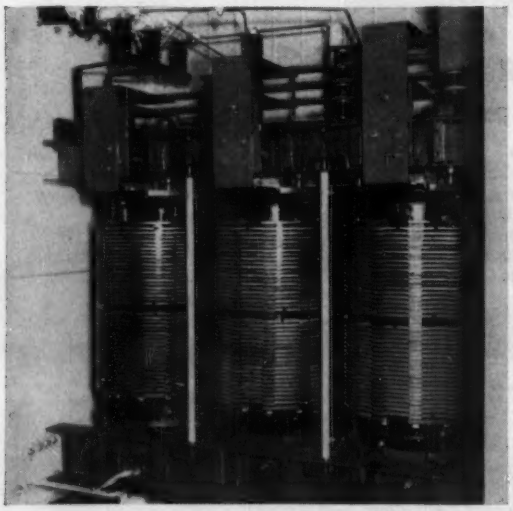
Crossover point. Showing how inner winding connects with outer winding at center of transformer secondary.

Diagonal connections between rings.



Crossover point on reverse side of transformer.

BRUTE STRENGTH SECONDARIES WOUND FROM SOLID BUS— NO MECHANICAL JOINTS



Completed dry-type transformer mounted in ventilated housing.

From one end of the secondary to the other in these I-T-E unit substation transformers, electricity flows through solid copper bus bar.

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Write for complete information. I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Streets, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

Transformer & Rectifier Division

EDITORIALS

That's What Association Means

We find ourselves nodding agreement to two particularly well-taken points in a recent address by GE's Lemuel R. Boulware before a New York State industrial association. Speaking of the responsibilities of association membership, his remarks have particular significance as electrical industry associations launch into the busy fall meetings season.

His two points were these:

• *That an association cannot do the job of its members or even of its spokesman . . .* The individual members must do their own basic jobs themselves back at the grass roots—including any required speaking up that they do publicly in their own names—with the association aiding through information and other guidance.

• *That a better business climate comes in the end from the composite of the improved actions of all.* It is thus not enough for some one business or company to do even an outstanding job of what is needed toward a better business climate in a community, a state or the nation. While one lone company's efforts will help measurably its own employee, supplier and community relations, the company is all too likely to be regarded as the exception and not as the rule.

With these sentiments we most heartily agree.

Continued development and acceptance of our industry depends in large measure on the wise counsel and leadership exercised through our associations.

But association staffs can't do it all. They can help plan programs, they can counsel and advise on how to organize and conduct them, and they can generate the materials used in executing such programs.

The effectiveness and ultimate success of any coordinated industry program rests squarely on the thoroughness with which it is carried down to and executed at the local level. Precisely here, individual company responsibility comes in. For participation under the association banner in industry programs is not a job for a half dozen of the "faithful," or just "the big boys."

This is everybody's job.

That's what association means.

Plan, Budget Now for National Electrical Week

Main objective of National Electrical Week, observed February 9-15, is to focus attention on the contributions of electricity to our economy and way of life.

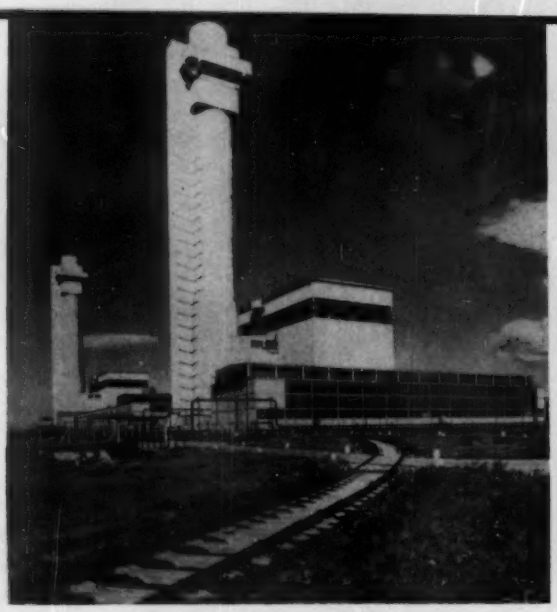
Planning kits containing ideas, copy, and other materials for the observance were in the mail early last week from the National Electrical Week committee. All major utilities, electrical leagues, dealer associations, manufacturers, and other members of the industry are being dealt in on the celebration. Major electrical advertisers are planning spots in their television, radio, magazine, and newspaper programs to carry the message to every consumer level.

But the success and impact of National Electrical Week in your area will depend largely on your own efforts. In all but a very few places, utilities will have to take the lead in planning, organizing, and carrying out the observance. They will want to cooperate with their allies, contractors, dealers, distributors, unions, inspectors, and manufacturers.

Because this leadership responsibility falls mainly on your shoulders, you will want to start planning and making arrangements now. The proposed plans and ideas in the new kit may help you determine the size and scope of the program in your area. There are additional ideas in our report of this year's observances (EW, March 4). You're almost certain to come up with ideas particularly applicable to your service area.

But it's time now to work out your own program and find out what your neighbors in the electrical industry are planning. Coordination will not only get greater impact, but it can save future embarrassment.

There's another pressing reason for marking up your National Electrical Week plans. They'll have to be provided for in next year's budget. Unless your NEW promotion is budgeted, it is likely to eat into your other campaigns next year.



Radioactive products spewed out . . .

and 3,000 workers took cover as . . .

Runaway Jars Britain's Atom Program

Plutonium factory incident at Windscale nearly reached A-bomb explosiveness. Modifications of nuclear stations may result; officials worry about reactor import impact

McGraw-Hill World News—It was a week ago last Thursday, October 10, when deadly radioactive products began spewing out of a giant 90 ft high overheated reactor at Britain's Windscale plutonium factory. The incident signalled a near disaster for the nation in the world's worst nuclear accident.

A 100% security blackout still masks cause and extent of the damage. But it now seems clear the incident involved several hundred tons of uranium which got well out of hand before detection. By that time it had all the potential of a major atomic catastrophe with only the bang missing. It was only finally averted by successful on-the-spot emergency action.

Civil Defense Alerted

Within two minutes of the incident the Prime Minister was notified of the possible need for wide-scale civil defense mobilization. The Atomic Energy Authority indicated that the possibility existed of radioactive fallout of an extent equivalent to that from an A-bomb blast.

At the factory 3,000 workers took cover. On the nearby Calder Hall nuclear power site workers were sent home, while Windscale No. 2 reactor was shut down to free men for emergency operations.

Most mystifying and alarming feature of the incident to physicists and metallurgists was the fact that it was not a criticality condition. The seven-year-old reactor was shut down for routine maintenance when overheating was discovered. This is taken to mean that some new, obscure nuclear mechanism has asserted itself which is certain to involve some modifications to Britain's civil nuclear power stations.

Nevertheless it is also apparent that the scale of the disaster exceeds that possible with Calder Hall-type reactors owing to essentially different design features. Additional instrumentation might well suffice to prevent a recurrence of this type incident with Calder Hall.

How this plant, which has been working without trouble for seven years, came to be afflicted is not clear. It appears that when discovered it was beyond known remedial action and that no solution was immediately at hand.

According to the official AEA statement, the reactor was shut down for routine maintenance when a considerable number of fuel elements were found glowing red hot. As a result uranium was being burnt and radioactive combustion and fission products were emitting from the stack. It is known that water was finally used to subdue the outbreak and quell the radiation heating effect only after frantic night-long calculations at Harwell indicated it was safe.

Isotopes Passed Chimney Filters

Immediate threat from the emission was centered on escape of volatile fission products, mainly radioactive isotopes of iodine. These were able to pass the chimney filters of the plant, while the solid longer-life elements of Strontium and Caesium particles were expected to be trapped. This still has to be confirmed, however.

Samples from freshly milked cows in the vicinity were continuously rushed to Harwell for gamma spectroscopy analysis, which immediately showed traces of radioactive iodine. Within 24 hours the content rocketed to six times permissible tolerance level. The next day all milk deliveries ceased in a three mile radius. This decision was announced in a special press conference convened on Sunday, October 13, to allay public concern. About 100

farms were then involved. On Monday the ban extended to 200 sq mi.

So far no further aspects of contamination have been reported, although there have been one or two incidents involving radiation burns on salvage personnel.

Later, news came that the whole matter was being discussed at cabinet level. Industry and government officials are deeply concerned at the possible effect on the nation's ambitious nuclear power program as well as any question-marks that might be placed over the drive to export Calder Hall-type reactors. They were quick to point out that the older Windscale reactor was open-circuit, air-cooled while Calder Hall is a closed-circuit, pressurized gas-cooled reactor.

Heating Effect a Likely Cause

Opinion seems to point to the incident having been caused by the heating effects of fission products—trapped in the fuel elements—continuing after the reactor was down. The heating effect is known and generally small. But the mechanism is not fully understood. Apparently the heating effect was allowed to proceed unchecked and undetected, possibly due to the fact that the idle reactor had no cooling airstream and because instrumentation may have been disconnected or unsupervised. However, there has been no evidence to indicate that the instrumentation failed to function. Speculation as to why this was the first charge to prove vulnerable suggests the use of enriched fuel or an excessive burn-up condition in the affected cartridges, aggravating the overheating effect.

Another possibility is that in some way oxygen from the cooling air stream reacted with the uranium. This could proceed even with the reactor shut down owing to the downdraft circulation caused by the chimney and the reaction triggered by a faulty aluminum can normally shielding the uranium.

The experts did not think that the process would snuff itself out, thus implying that it would finally involve the entire uranium charge.

Just when the emergency passed has not yet been disclosed, but now the reactor lies waterlogged and cold. No. 1 reactor is now back at work and construction of Calder Hall reactor again proceeds.

WASHINGTON WIRE

Southwest Hydro Studied

A long-range program for development of hydro power in the Arkansas, White, and Red River Basins in the Southwest has just been released by the Senate Public Works Committee.

The plan calls for construction of 44 hydro projects with an ultimate planned capacity of 2 million kw. A capital expenditure of over $5 billion would be required. Development of this program has been a seven-year task for an inter-agency committee authorized by Congress in 1950.

Past Projects Not Re-Studied

The report makes it clear that projects previously authorized and recommended in the area have been considered as projects in existence and have not been re-analyzed or evaluated for the purpose of the present study.

The report for the AWR project promises to raise some problems in the future:

1. The report does not furnish an adequate basis for the authorization of specific programs and projects, pointed out Percival Brundage, director of the Bureau of the Budget.

Further detailed study will be needed in the future before any projects are started, he claims. The purpose of the report is mainly to identify and appraise the potential of resources in the area and to provide a framework within which federal, state, and local agencies, and private enterprise can operate.

Steam Still Needed

2. Of more significance, perhaps, is the fact that these hydro projects will be economically feasible only so long as they are considered as peaking power projects. This point was brought up by Federal Power Commission Chairman Jerome K. Kuykendall. He claims that steam electric sources would be needed for serving base load requirements.

In view of this factor, the marketing of the power from the proposed projects becomes important. In effect, it means that the power will be feasible only on large integrated systems and this almost certainly rules out many preference customers.

3. Another possible controversial aspect, raised by Assistant Secretary of Agriculture E. L. Peterson, is that economic justification for some of the projects has not been analyzed in accordance with the criteria set out in Bureau of Budget Circular A-47.

Specifically, this circular states that in determining economic justification for a project, it is essential that comparable interest and tax charges be applied to both the project and the cost of the cheapest alternative expected in its absence, which is used as a benefit to the project.

Apply Comparable Rates

Peterson says it may still be an issue whether project rates or alternative rates should be used in obtaining comparability, but the need to apply comparable rates is clear, he maintains.

4. The bulk of the projects, especially in the lower portions of the three basins, would operate at comparatively low annual load factors during certain years of critical stream flow. This problem of economically justifying the hydro projects is underscored in the report itself.

In these critical years the available head would be such that the capacity of the plants could not be operated around the clock but would be shut down for about 70% of the time. Alternatively, 30% of capacity could be operated full time.

4.4-Million Kw Load by '65

The survey finds that the area concerned will need 4.4 million kw by 1965 and 11.0 million kw by 1975. Thus all of the potential hydro 2 million kw capacity could be absorbed in the area by 1975. The rest would be supplied by steam stations.

The market area includes all of the states of Arkansas, Kansas, Missouri, Oklahoma, and parts of Colorado, Louisiana, Mississippi, New Mexico, and Texas.

Financial Outlook: Time Looks Ripe

- **With present high interest rates on funded debt, common stock offerings may prove profitable now**

- **In the recent market value drop, stocks of a utility sampling in big cities fared better than groups of midwestern and growth utilities.**

After a sharp rise in June and early July, interest rates stabilized on new issues of funded debt of electric utilities. The rates reflected a modest improvement during August and September.

Today, more than usual uncertainty besets the long-term money market. With business poised unsteadily at top average levels of activity, indications of lessening backlogs of orders and other factors may herald cessation of further advance in business activity, if not a decline. If a slump develops, demand for long-term funds may begin to dwindle.

It seems unlikely, however, that any such decline in demand will be reflected much during the balance of this year. But next year is another story. If expansion lessens, moderate relief for long-term borrowers may ensue. Supply of money for this type investment remains relatively constant, increasing gradually with the economy and population. Therefore, the big factor in determining interest rates for funded debt should continue to be a demand on the money market for these long-term funds.

Top in Interest Rates

Another view recently expressed by a leading investment service is that a top in interest rates already may have been established and a movement from the present high rate plateau is more likely to be on the downside. The firm looks for nothing sensational in this direction, at least for the next six months.

Indicative of the bond market's moderate recovery in the last two months, a "Wall Street Journal" tabulation (October 2) reflecting 14 new utility bond issues shows average yields based on current bid prices were ten decimals (0.10% per annum) lower than average yields on the basis of original offering prices. Significantly, each of these 14 issues reflected a lower current yield.

Little Change Over '56

Most utility common stocks have held at relatively favorable price levels for prospective issuers, considering both price-earnings ratio and dividend yield. While these issues had ups and downs in the past 12 months, Dow-Jones utility stock average was substantially the same at August 31, 1957 as a year previous. Deviation is less than 1% on the down side.

Utility stocks tended to rise in price until July and then met with liquidation caused by:

- An unfavorable rate decision which was given undue importance.
- Unwarranted fear that higher money rates would begin reducing earnings.
- General market weakness in all categories of stocks. The downward trend during most of August continued into September, then was followed by a mild rally.

In the box below, a tabulation shows that a "moderate sized midwestern" group and the "growth" group reflected declines in the period approximating the July 31 to October 1 span shown by the Dow-Jones average. Meanwhile the "big-city" group showed a considerably smaller percentage reduction in market values.

Trend Continues This Month

After the sharp stock market decline of October 10, the Dow-Jones utility stock average went to $65.12 as against $66.76 at October 1. While the five "big city" and moderate sized midwestern utility stocks held, the five "growth" stocks slumped further from 3.9% to 5.3%.

Average cost of common stock equity money to the electric utility industry has, of course, increased during the past year by more than the meager decline in average market price levels. This is because of the rise in both industry earnings and dividends paid out. The same price level reflects a higher average money cost upon sale of additional shares since each share carries somewhat higher earnings and dividends.

Advantages of Common

Since common stock money still seems reasonably priced to the issuer, companies needing this type of money in the near future would seem wise in proceeding with such financing soon. With present high interest rates on funded debt, it may prove profitable to postpone debt offerings and substitute sale of a like amount of common stock if the capitalization structure can stand it.

As to fund raising by sale of funded debt or preferred stock, the trend toward a somewhat brighter future for interest rates from a borrower's standpoint doesn't seem definite enough to justify deferral of funded debt offerings where this

'Big City' Utility Stocks Fared Better in the Price Dip

	Market Prices		% Change
	July 31	Oct. 1	
Average of 5 electric utilities in . . .			
"Big cities"	$36.02	$35.42	DOWN 1.7
"Growth" areas	46.92	45.10	DOWN 3.9
Midwest	31.05	29.73	DOWN 4.2
Dow-Jones Utility Stock Average	69.88	66.76	DOWN 4.5

for Common

type of capital will be needed shortly.

The sole exception seems to be cases where common stock can be substituted profitably along lines mentioned above. Acceleration of sale of funded debt securities likewise appears undesirable.

While chances of a moderate future decline in interest rates aren't sufficient to warrant postponement of the raising of needed debt funds, there is enough possibility of lower rates in the not too distance future to make acceleration of offerings appear undesirable.

Redemption Choices

In funded debt offerings the problem of limiting redemption remains an important factor for consideration. Three choices have to be evaluated:

1. The decision whether to reduce interest to a minimum by complete prohibition of redemption for a limited period.

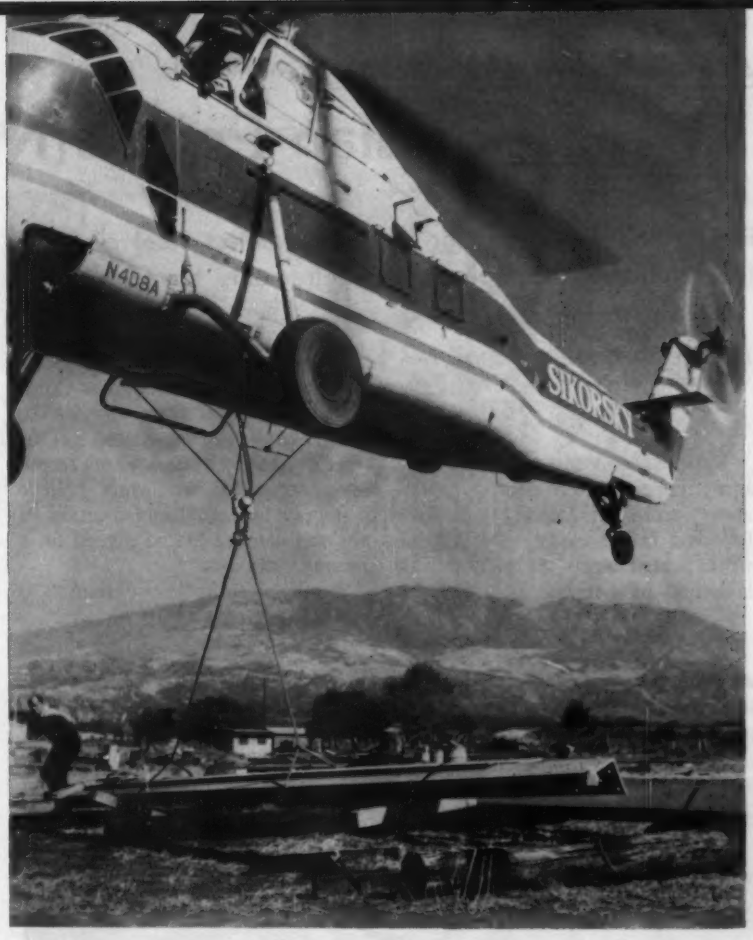
2. To compromise by giving the lenders a share in the profit upon subsequent redemption within such period.

3. To retain No. 1 and 2; but this will mean a higher rate.

Choice must be made by each utility in the light of its own circumstances. One case which might justify complete prohibition of redemption with consequent minimum interest is where earnings are expected to decline and divided payout is relatively high. Therefore, maintenance of earnings at the highest possible level is paramount to avoid fear of dividend reduction with consequent decline in market values.

FRB Action Appears Remote

Federal Reserve Bank policies will, of course, remain a potent factor in determining the trend of future interest. Indications of a recession likely would lead to action for relief of borrowers. But any such action presently appears to be distant. On the other hand, further increases in rediscount rates now seem unlikely in the near future. Chances appear better for either a continuance of present policy, or alleviation of the borrower's lot.



To clear rugged transmission terrain . . .

'Copter Starts a 2-Ton Shuttle

The first helicopter airlift of men and materials by a utility company on the West Coast is being tried by Southern California Edison Co. The airlift is expected to speed construction of transmission towers and lines across a 26-mi stretch of rugged mountain country near Santa Paula, Calif.

Substantial savings are anticipated if the trial proves successful.

The S-58 Sikorsky whirlybird, above, demonstrates that it can lift loads up to 4,000 lb and shuttle them to elevations up to 3,000 ft.

In the operation, the craft hovers above the ground as initial loads of structural steel and other materials are tied beneath it. Material is then shuttled to the site where the whirlybird again remains aloft during unloading. In this way, it can move 600 tons of steel in about four weeks.

Based at Ventura airpark, the helicopter picks up personnel and material from service points at Santa Paula, Fillmore, Piru, and Edison's Santa Clara substation near Saticoy.

Transmission towers are being installed at intervals of from 700 to 4,400 ft. between the Santa Clara substation eastward toward the Saugus substation. The 220-kv line will ultimately be the main transmission link from Mandalay Steam Station, Edison's $60-million plant under construction near Oxnard, Calif. Contractor for the tower work is Fluor Corp.

The airlift marks the second new use of helicopters during the past year by Edison. Last winter a whirlybird flew in a survey team that measured depth and moisture content of snow above Big Creek power stations. The run-off forecast study was completed in a single day. In the past, it took two teams of hydrographers ten days to cross the frigid mountain slopes on snowshoes.

Indian Point's Nuclear Design

Pressurized water reactor will use stainless steel cladded fuel elements. Containment requirements have changed

JAMES F. FAIRMAN, Senior Vice Pres, Consolidated Edison Co of New York, Inc, New York, N. Y.

Experience to date with Con Edison's nuclear-fueled electric generating station at Indian Point has followed rather closely the pattern we expected when the project was launched by our late board chairman, Hudson R. Searing, in 1954.

Testifying before the Joint Committee on Atomic Energy, Feb. 10, 1955, Mr. Searing stated, "Our chief objective has been to get something done, for we firmly believe that only by actual construction of projects can the art be placed on a commercial basis."

At this writing, more than $20 million has been spent or committed on the Indian Point project. Final stage blades for the turbine by Westinghouse have been tested. The initial design of the twin superheaters by Foster Wheeler has been approved and detailed drawings are being prepared. Condenser tube welding techniques are under review by Ingersoll Rand.

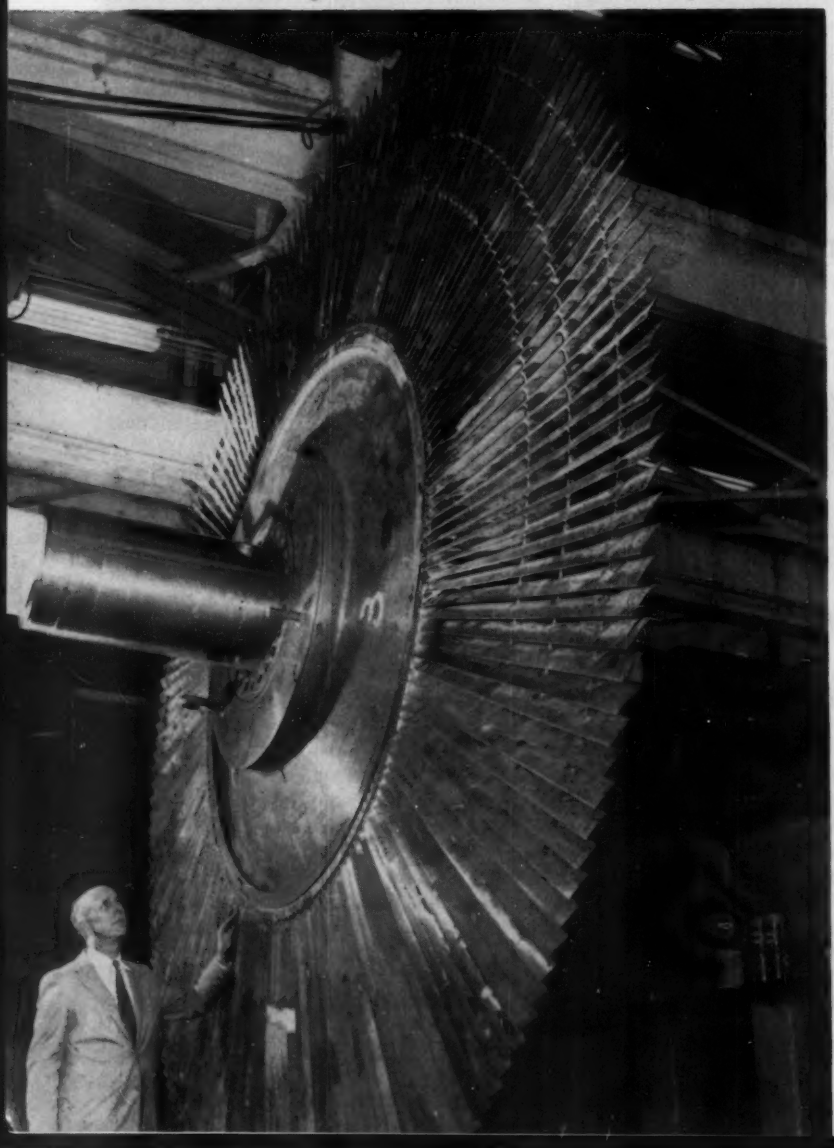
Quite recently, a major design change in the nuclear core was made by our reactor contractor, Babcock & Wilcox. Pin shaped tubes to contain the Uranium-235 and Thorium-232 in oxide form were to have been fabricated of zirconium. These are now to be made of stainless steel which is cheaper to fabricate.

This use of stainless steel for the core pins is not an unmixed economy, and the decision has not been an easy one to make. A larger loading of nuclear fuel is required to offset the greater neutron capture cross section of the steel compared with zirconium. The new core, however, should run 660 full power days without reloading.

In the interest of further economies, we have abandoned the idea of obtaining access to the sphere in order to maintain part of the equipment during operation. This permits us to eliminate a major portion of the concrete originally designed into the sphere to serve as a biological shield. In turn, elimination of this concrete will make it possible to reduce the containment sphere from 190 ft to 160 ft diam.

The biological shield of concrete will now be provided in the form of an envelope around the sphere.

44 IN. LAST ROW EXHAUST BLADES of turbine are shown on a test disc. The 275-Mw turbine will be designed for throttle steam conditions of 370 psia and 1000F



No Change in Completion Date

Earlier field construction drawings for the 190 ft sphere with an internal biological shield have had to be replaced due to the changes. However, we still expect to have Indian Point completed in 1960.

Estimated plant costs have been moving up because of escalation clauses in the various contracts as well as the design changes to be incorporated in the finished plant. The final figure may be about $90 million for 275 Mw of gross capacity.

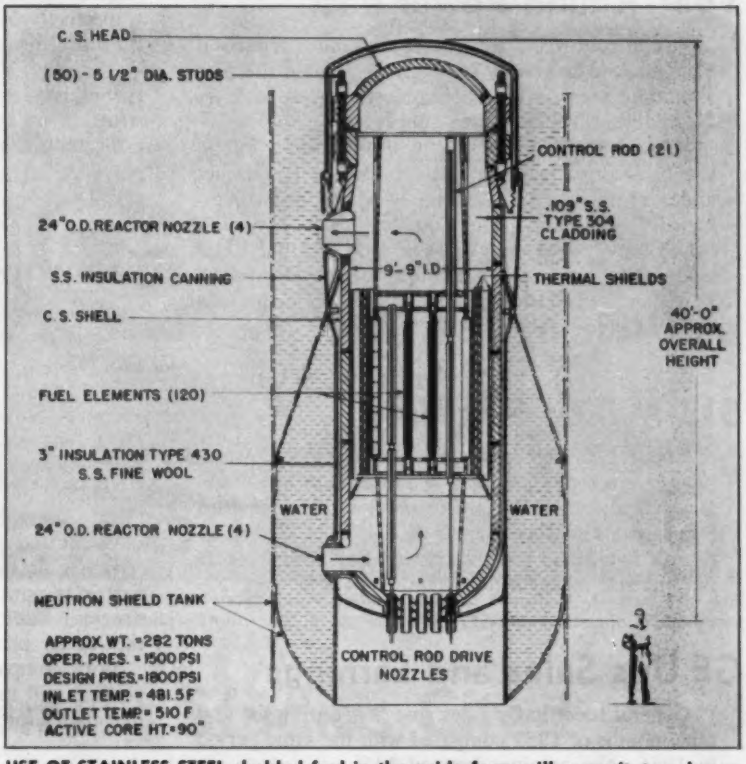
These costs, however, must be

Revised by Consolidated Edison

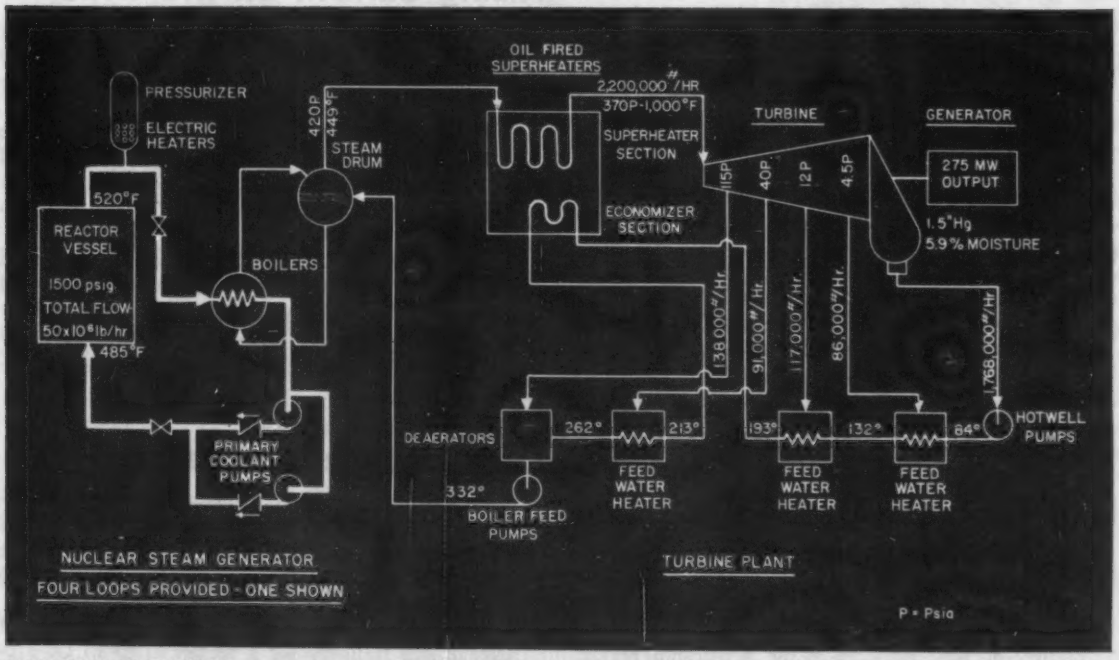
considered in the light of the advances that have been made. Our contractors have already added substantially to the nation's knowledge of thorium as it would be used in power applications. This research on thorium metal resulted in our shift to the use of an oxide.

Con Edison's construction experience has already been helpful in the task of translating the nuclear designs into station layouts. As the plant takes shape, this experience should continue to prove of value. Engineers can appreciate the economic stresses that occur between the drawing board idea and the actual field work. These are what we have been undergoing on the Indian Point project.

We feel the pressurized water uranium-thorium converter reactor represents a real contribution to the advancement of the art, and, as Mr. Searing said back in 1955, "We want to get on with the job, and as far as possible we want to do it in the same way we normally carry on our business."



USE OF STAINLESS STEEL cladded fuel in the oxide form will necessitate a larger fuel loading than originally contemplated but the life of core will be longer



HEAT BALANCE DIAGRAM shows the use of feedwater heaters and deaerators. Oil fired superheaters will have economizer sections. There will be two pumps in each of four coolant loops used in the reactor portion of the plant

Year-'Round Power Pact

Within four years the Alcoa aluminum reduction plant near Wenatchee, Wash., will become the first aluminum plant in the Pacific Northwest to have an assured year-'round power supply.

So said Kirby Billingsley, Chelan County Public Utility District manager, in announcing a contract under which the PUD will supply Alcoa with 10,000 kw of "high-quality" interruptible power. It will be cut off only during short daily periods when the PUD load reaches a peak. This differs from Bonneville Power Administration's seasonal cut-offs in periods of low Columbia River water.

$15-Million Pay Hike

About 120,000 Westinghouse Electric Corp employees got a pay increase of $15 million last week. It was the third in a series of annual wage boosts, and provided an automatic raise of 3% over 1955 base rates with a 5¢ an hour minimum. For most workers the increase meant a total gain of 14½% over '55.

GE Ups Sales and Earnings

General Electric Co sales rose 7% during the first nine months of 1957 compared with the same period in 1956. Net earnings jumped 14%.

Sales through September of this year hit $3,169,276,000 *vs.* the 1956 level of $2,962,780,000. Net earnings amounted to $182,988,000, equivalent to $2.10 per share of common stock and 5.8¢ per dollar of sales. In the first three quarters of 1956, earnings reached $160,727,000, or $1.85 a share.

The company also set records in employee earnings and payments to suppliers, Pres Ralph J. Cordiner announced last week.

Connecticut Accord

Stockholders approved the merger of Connecticut Power Co into Hartford Electric Light Co on October 15. About 80% voted in the affirmative at separate meetings. If Connecticut and federal regulatory agencies approve, the merger becomes effective January 2.

Iran Plans Its Own TVA

A $59.3-million dam in Southwestern Iran will launch the nation on a development comparable to the Tennessee Valley Authority. The proposed 460-ft structure is expected to be the first in a series of multiple-purpose projects in the Khuzestan region.

The TVA objective rests now in the hands of two men qualified to achieve it—David E. Lilienthal and Gordon R. Clapp. Board chairman and president, respectively, of Development & Resources Corp. Both are former TVA chairmen.

The New York firm has been asked to complete preliminary work on the dam. It also will start construction on four related agricultural and industrial projects, including a cane sugar mill and refinery, a polyvinyl chloride plastics plant, and a gas pipeline.

Teamwork at Yuma

Clamshovels are excavating dirt for a new 160,000-kw generating plant in Yuma, Arizona. The $25,365,000 station will be jointly owned by Arizona Public Service Co and California Electric Power Co.

Public Service will operate the plant. The first 80,000-kw unit will belong to Calectric; the second unit will be PS property. There will be certain "common facilities" to be used by both parties. An "axis" line will divide the site into two equal tracts for legal and operating purposes.

Imperial Irrigation District of California is taking part in a power pool with the two companies. The district's Pilot Knob hydro plant will connect with the Yuma plant.

Both companies said joint ownership and power pooling will result in considerable construction savings and afford greater efficiency in plant operation.

Rising Current on the Ohio

The banks of the Ohio River, scene of rapidly growing industrial development, have been chosen by Appalachian Electric Power Co as site for a future steam electric generating station.

The proposed AEP plant, which would join five sister AG&E plants now located on the river, would be built at the newly purchased 1,450-acre site at Apple Grove, W. Va. The AG&E system has two other power plant sites on the river.

The new AEP site, through which a B&O Railroad line runs, was chosen for proximity to abundant and economical coal reserves, availability of river water for steam condensing purposes, and location near the center of the seven-state area which AG&E serves.

Electronic Rummage Pays Off

Various useful gadgets, from crystal sets to electrocardiographs, raised $1,200 for AIEE's Portland Section at its recent electronic rummage sale. Over 2,000 visitors attended the one-day event at Portland General Electric Co's service center.

Proceeds were turned over to Oregon Museum of Science and Industry for a memorial to F. O. McMillan, long a faculty member in Oregon State College's electrical engineering department.

W. T. MORTON, Pennsylvania Power & Light, describes high-voltage fuse replacement to L. T. Robertson, Public Service Co of Colorado, H. E. Deardorff, Dayton Power & Light, and K. L. Wheeler, Cleveland Electric Illuminating

Rotor Prewarming Studies Cited

Seek to particularize procedure and reduce start-up time, EEI System and Equipment Group is told at Denver meeting

Blanket recommendations for prewarming large 3,600-rpm generator rotors soon may give way to particular advice for each machine in service. General Electric is confident that individual test evaluation methods, now under study, will permit field test programs to be effected in the near future.

This hope for reduction in start-up time on an individual machine basis was held out to the Electrical System and Equipment Committee of the Edison Electric Institute in their early October Denver meeting.

GE field teams would assay the condition of each rotor, using latest metallurgical and sonic techniques, Carl Schabtach told the committee. Considerable reduction of the number of machines requiring prewarming should be realized by this program, he said.

For future machines, however, major improvement in rotor forging toughness will be realized by lowering steel transition temperatures. Metallurgical research continues full-time toward this goal, Schabtach said.

Rotor Toughness Stressed

While agreeing that lowering the forging transition temperatures is desirable, J. K. Dillard, Westinghouse Electric Corp, stressed other factors. Atomically dispersed hydrogen inclusions can cause the rotor to burst even though steel is above the transition point, he said. Steady metallurgical advances on a fundamental level are the solution to the rotor toughness problem. Present knowledge of alloys can insure a conservatively tough rotor, Dillard said, but limits still are imposed on alloy compositions by magnetic permeability considerations.

Users are concerned about extra start-up time required by rotor preheating, several utility engineers told the manufacturers during the meeting. Three-fourths speed during preheating can cut an hour off half-speed starting time, L. T. Rosenberg, Allis-Chalmers Mfg Co said, because of much higher core and windage loss.

The meeting was highlighted by a trip to the Leadville High Voltage-High Altitude test line. The 2-mile-high facilities were built by Public Service Co of Colorado in collaboration with manufacturers.

Full testing operations have been underway since early summer, with instrument calibrations essentially completed, reported L. M. Robertson, PS of Colorado. Committee members witnessed high-voltage disconnect line switching. Robertson told them the disconnects recently were equipped with switching resistors to mitigate surges on the 6,700-ft line, operated as high as 289 kv to ground.

Field data on corona losses and radio interference at high altitudes and wide ranges of weather conditions are the goal of the Leadville project. Conductor arrangements have been selected to give direct

altitude comparison with American Gas & Electric Co's Tidd Project data, Robertson said. But a 1.40-in. expanded ACSR two-conductor bundle, expected to give corona loss and RI levels considerably lower than necessary, will provide a "point on the conductor-diameter curve" allowing interpolations rather than extrapolations to find practical sizes, Robertson said.

Upward trend in switchgear prices has drawn concern of the AEIC-EEI-NEMA Committee on Power Circuit Breakers. Switchgear, though more standardized than turbine-generators, is subjected to roughly the same rate of price hikes, R. R. Wagstaff, United Engineers & Constructors, reported. Surveys also have shown, Wagstaff continued, that 95% of 4-14-kv switchgear buyers will accept stored energy closing mechanisms.

Of 50 utilities answering a comprehensive survey on generator insulation troubles, 38 admitted failures requiring coil replacement in 295 cases, 260 machines being involved. The survey preludes development of standard impulse ratings and tests for generators by working committees studying revision to ASA-C50, Standard for Rotating Electric Machinery. Lightning was known definitely as the cause of 34 failures, and of these 19 machines had no lightning protection, the EEI group was informed by C. E. Asbury, Commonwealth Services, Inc.

Hits 'Buy American'

Contentions that utilities must always "buy American" are illogical. Foreign commerce is a two-way phenomenon, stated R. P. Crippen. Ebasco International Corp. Over the long haul the U. S. cannot export more than it imports, unless taxpayers continue to grant dollars abroad.

Crippen outlined factors to be considered in the purchase of European equipment. He termed none of the inconveniences insurmountable, but advised that the cost differential favoring the foreign bid should be adequate to permit one or more factory trips by competent U. S. engineers. The supplier often relies on the design ability of one expert, Crippen said, so that to prevent judgment errors, his early design should be reviewed on his home grounds by engineers from the purchasing company.

Extra-long switch sticks permit changeout of 66 and 132-kv fuses from ground level on Pennsylvania Power & Light Co system. A redesigned switch head on the fuse holder, and a 3-in. pulling eye facilitate the operation, said W. B. Morton.

One unique feature is a 10-ft vertical pipe with its lower 6 ft buried below ground directly under the 132-kv fuse, permitting dropping of the 20-ft switch stick into the ground to lower the fuse element for handling.

Calls A-Progress Recruitment Aid

Speaker tells AEIC-EEI meter groups nuclear gains and utility company growth should attract college graduates

Nuclear power progress and the industry's rate of growth should attract college graduates to the electric power companies, Allen S. King told the Association of Edison Illuminating Companies and the Edison Electric Institute recently at Minneapolis, Minn. King, who is president of Northern States Power Co, spoke to the groups' Joint Committee on Meters and Services.

A systematic search in Northern States Power he said, uncovered among employees qualified talent which, when channeled into the most exacting technical positions did outstanding jobs, although these employees had been engaged in nontechnical work.

Sample testing of watthour meters offers opportunities for better results as well as lower costs, said W. W. Harrison, Virginia Electric and Power Co, and C. V. Morey, Consolidated Edison Co of New York. Harrison reported testing experience, and Morey described a proposal of utility companies to the New York State Public Service Commission. The New York proposal seeks permission to sample meters for testing.

Favor Single Meter

VEPCO, according to Harrison, tests a sample number of meters and analyzes the test results by type and age. In the New York proposal, meters would be divided by type, and the samples of each type tested yearly would be representative enough to enable the companies to determine the performance of each type. This method, Morey said, is expected to detect inaccurate meters faster than the routine methods in vogue.

The results of tests on samples selected at random, as used by manufacturers and the military services, tend to follow the normal probability curve, said Floyd Busch, General Electric Co.

Balloting of the committee yielded a 21-to-17 split in favor of companies willing to use a single meter for both delta and wye-connected, 3-phase service. Such a meter can be made available, its desirability hinging on whether its acceptance would reduce manufacturing and stocking problems.

A new gang-test board has increased the testing efficiency on polyphase meters by 50 to 100%, W. H. Farrington, Texas Electric Service Co, told the committee. The board was designed by the Texas utility and built by a manufacturer. It has 12 positions, and four, eight, or 12 meters can be tested simultaneously.

Only one meter seal meets all requirements, said D. A. McNulty, Connecticut Light & Power Co, in his comprehensive report on types of meter seals. As tabulated in his report, seals must prevent tampering, be easy to install and remove, and take limited space.

Crossing Mississippi flood area, submarine cable . . .

buried in trench . . .

Powers Plant Pumping Station

INDUSTRIAL Construction

Underground cables laid as unit in covered trench traverse muddy terrain which raised installation problems

ARTHUR KASPAR, Chief Electrical Engineer, Guarantee Electrical Co, St. Louis, Missouri

Submarine cable buried underground provides highly reliable power for pumping water to the Pittsburgh Plate Glass Co plant at Crystal City, Mo. Serving Ranney Wells Pumping Station on the Mississippi, the 1,600-ft cables cross land submerged in the spring when the river rises 25 ft above its low-water level.

Power for the pumping station is carried on a 15-kv, No. 1/0, 23-conductor, 37-strand, grounded submarine cable. A 24-conductor, No. 12, 19-strand, submarine cable carries motor control circuits.

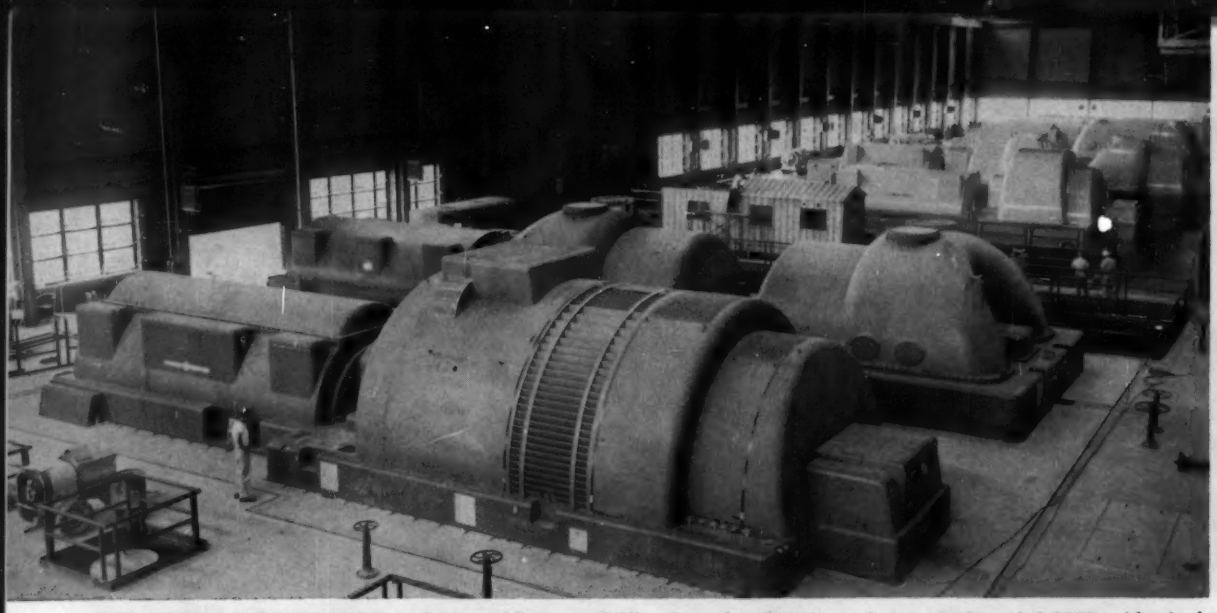
The pumping station has a 300-kva, 3-phase, 13.2/480-wye-v transformer whose output is connected through an outdoor control center to four 75-hp pump motors. Automatically controlled sequence of operation permits selection of the proper pump and control of reservoir level from a remote location. As reliability of electrical equipment is critical in a plant operating 24 hr a day, top-quality materials were specified.

Cables were purchased in 1,600-ft lengths to eliminate splicing. Power cable weight posed a problem in handlings. Cable reel was 108 in. in flange diameter and 81 in. in outside width. Weight of reel and cable was 21,000 lb. The control cable reel was 84-in. in flange diameter, 60 in. in outside width. Its total weight was 11,000 lb. Combined weights came to 16 tons.

A 25-ton flat-bottom float with a 10-ft spread and 16-wheel capacity handled the cables. Both cables were reeled out as a unit into a 24 x 48-in. trench. A bulldozer cleared trees and bushes to afford a 25-ft right-of-way. Although sandy and muddy ground prevented the truck from furnishing sufficient power for moving the loaded float, the expedient of putting the bulldozer before the truck to pull both truck and float enabled the crew to drop cables at about 3 mph.

The cable once laid, the crew backfilled with sand, covering this with creosoted planking for extra cable protection. When grading was completed, red concrete markers were placed every 20 ft to identify the cables.

BULLDOZER pulls both the truck and the float. It was found that the truck could not haul the float carrying its 16-ton load across soft, sandy ground



NEW CROSS-COMPOUND UNIT is latest addition to Will County station of Commonwealth Edison Co. Steam conditions for 275-Mw unit are 2,000 psi/1,050F with single reheat to 1,050F. LP turbines has 43-in. last stage blades

275-Mw Unit Has Low Heat Rate

GENERATION
Design

Commonwealth Edison's newest unit has 8,885 Btu per kwhr heat rate at 277 Mw and 1 in. of mercury back pressure

R. G. SCHMIDT and **J. J. GREGORY**,
Engineers, Commonwealth Edison Co, Chicago, Ill.

The world's largest and one of the most efficient steam turbine-generators, a 275-Mw unit went into service at Commonwealth Edison's Will County station recently.

Besides being the largest turbine-generator yet placed in service, Will County's Unit 3 has the longest last-stage turbine blades in operation. They are 43 in. long. At 277 Mw, the turbine heat rate is 7,325 Btu per kwhr.

The attractive heat rate was made possible by the very large unit size, the steam conditions, seven stages of feedwater heating, and the long last-stage turbine blades which extract maximum heat from the steam before discharging it to the condenser. The good vacuum, one in. of Hg, justified use of the unusually long last-stage blades.

Soil conditions made borings necessary for nearly every caisson, and required special measures in foundation design and construction. The new chimney is 450 ft high, compared to 350 ft for stacks of Units 1 and 2. Precipitators and induced draft fans are outdoors. The boiler feed pump and the condensate booster pump are driven by the same motor.

The turbine-generator unit is a cross-compound type. A high-pressure element with a high pressure and an intermediate cylinder are on the 3,600-rpm shaft. A double-flow low-pressure element with the 43-in. last row blades is on the 1,800-rpm shaft.

Single Reheat Used

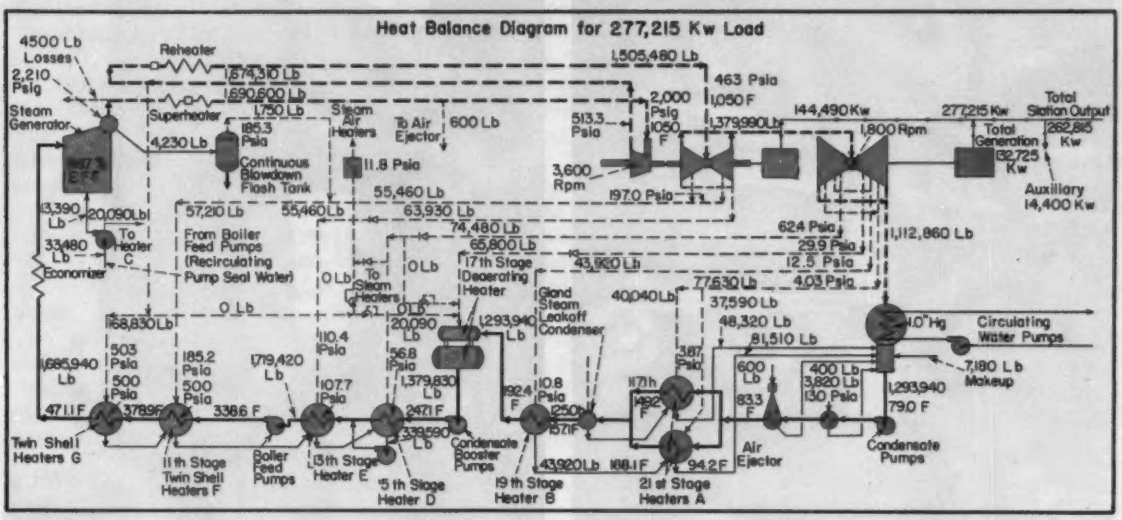
Steam enters the throttle at 2,000 psi with superheat and reheat temperatures of 1,050F. At the guaranteed capability of the unit, the maximum throttle flow will be 1,690,000 lb of steam per hr. This includes 50,000 lb per hr for steam air heaters. Load division of the unit at its rated capacity is 143,000 kw on the high pressure and 132,000 kw on the low pressure elements at 15 psig hydrogen pressure.

Installation of a platform at the operating-floor level extending outside of the building walls permitted withdrawal of the low-pressure generator rotor with use of the existing turbine room cranes. Due to their size, the tenth-stage wheels were shipped separately and pressed onto the rotor at the site.

The steam generator has a guaranteed capability of 1,800,000 lb of steam per hr at 2,100 psi, 1,050F at the superheater outlet and 1,050F at the reheater outlet.

The unit has two separate furnaces. One supplies the secondary superheater, and the other the reheater. It is a controlled circulation type boiler with four circulating pumps of 33⅓% full-load capability each. A common drum is used for the two furnaces.

There are 64 tilting, tangential-type coal nozzles. Eight are in each corner of each furnace. There are eight Raymond bowl mills, four for each furnace. Each mill will furnish pulverized fuel to a pair of coal nozzles in each of the four corners of a furnace. Capacity of the mills is such that a total of six—three on each furnace—are capable of maintaining full load on the boiler.



HEAT RATE is calculated at 8,885 Btu per kwhr at 277 Mw and 1 in. of mercury back pressure. Seven stages of feedwater heaters are used with the boiler feedpumps taking their suction from the second intermediate feedwater heater

In addition to the coal nozzles, there is one electrically-ignited, oil warmup torch in each corner of each furnace for use when starting the boiler.

There are four forced-draft fans, four sections of precipitator, four induced-draft fans, and four air preheaters. Two of each of these serve each furnace.

There is no cross tie between the ducts of the two furnaces. Each furnace has its own separate air and gas duct system. This design reduced duct work, eliminated some dampers and reduced combustion control requirements. Savings were thus possible. Increase in capacity made available by interconnected duct work in case of a fan or preheater outage did not justify the additional cost.

Induced-draft fans have hydraulic couplings for control of gas flow with a damper at the discharge for improving the rate of response and isolation of the fan. The discharge from the induced-draft fans connects into a common duct before entering the chimney.

Isolation dampers were installed to permit taking either leg of the duct system from either furnace out of service for maintenance or repair of the equipment. Precipitators were installed between the preheaters and the induced draft fans. They are constructed in four sections, each serving one preheater and fan system.

Twin, single-pass condensers, each with 70,000 sq ft of surface, were installed at right angles to the unit. They are solidly connected through the condenser neck to the turbine exhaust and are spring supported. Two 72-in. equalizing lines connect the condenser shells.

Water Boxes Are Divided

The water supply from the four circulating water pumps enters the main building in a common line and divides into two headers, one on the south side of the condensers and one on the north. The water boxes are divided to permit a counterflow through each condenser section. Interconnected valves on nozzles and discharge pipes permit reversing the flow for cleaning purposes and also for cutting out half of a condenser section for repairs. Valves for each half of a section are interlocked so that when the supply valve is open at one end the discharge valve is open at the other.

Each condenser shell has its own hotwell with equalizing lines connecting the two. Three vertical condensate pumps take their suction from the hotwell under the east condenser.

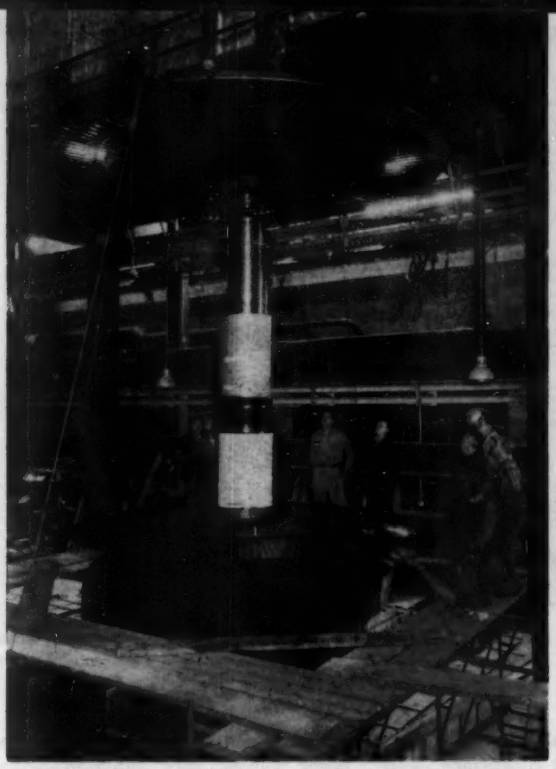
There are three, motor-driven, nine-stage boiler feed pumps. These pumps take their suction from the second intermediate pressure feedwater heater. Each pump has a hydraulic coupling to control the flow of the feedwater to the economizer. There are no boiler feedwater regulating valves, their function being performed by the hydraulic couplings.

Each boiler feed pump has a capacity of 60% of the maximum guaranteed capability of the steam generator. Recirculation for the pumps is automatically controlled by the rise in temperature between the suction and the discharge of the pumps to permit low-flow operation of the pump without overheating.

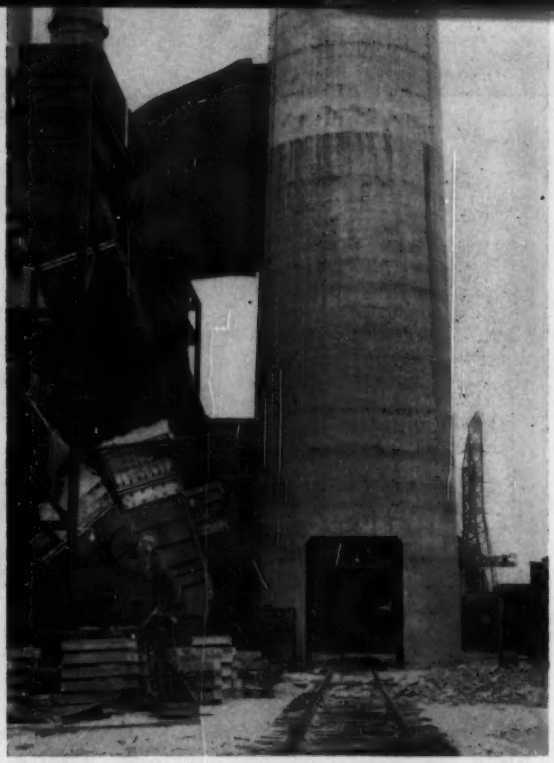
Three motor-driven 3,600-rpm condensate booster pumps take their suction from the deaerating heater. Each supplies 60% of the maximum load requirements of the unit. Use of these pumps resulted in considerable savings because they permitted the use of intermediate-pressure heaters and eliminated the booster pumps and the need for long multistage boiler feed pumps.

Costs were also cut by using a common motor drive for the boiler feed pump and the condensate booster pump. A hydraulic coupling between the driver and the boiler feed pump permits operation of the condensate booster pump at constant speed while the boiler feed pump is operated at variable speed although the two are driven by the same motor. This simplified the control arrangement because it requires no artificial means of interlocking or automatic start up in case of loss of one of the pumps.

Controls will be centralized for



43-IN. BLADES in tenth stage of turbine were shipped separately and pressed onto the turbine rotor at the station



CHIMNEY straddles railroad track to the service building. Design results from space limitations in the stack area

Unit 3 and future Unit 4. To minimize space requirements, many small size instruments and controls were mounted on a bench-type board. Full-size recorders were installed on vertical gauge boards.

The boiler and its major auxiliaries can be started, adjusted, or stopped from the control center. Because provisions were made to light off the boiler from the benchboard, a television camera was installed in the front wall of each furnace. This enables the operator to view the lighting off operation on a screen mounted on a vertical gauge board directly behind the light-off controls.

Entrance velocity of the circulating water was reduced by flaring out the bays at that point. In the substructure of the cribhouse there are four individual, 10-ft wide bays. They are flared to a width of 17 ft each at the point where the circulating water enters the intake area.

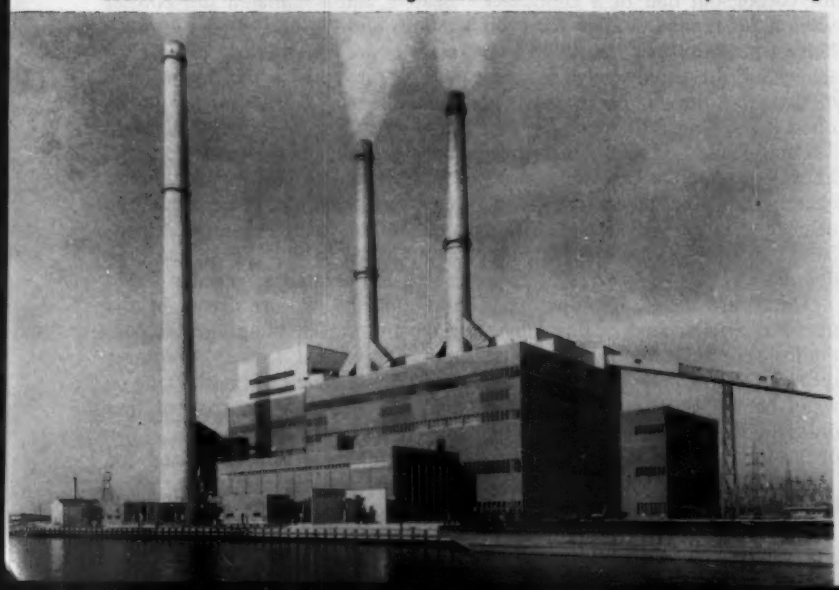
The design was based on results of experiments conducted at the University of Iowa. A scale model of an intake tunnel was set up and different intake velocities and their effects were studied. The object was to develop a design that would eliminate, or at least minimize, vortices that would draw floating debris down the curtain wall. Results have been very satisfactory.

Rack bars with 2-in. free spacing were installed at the water entrance. Within the building, four 10-ft-wide, front-wash, two-speed rotating screens were installed. Normally these operate at low speed on a sequential basis, controlled by an electric timer. In addition there is a level differential control system whereby the screens are started automatically on high speed when the differential across the screens reaches a predetermined setting.

Fly ash is removed from the economizer and precipitator hoppers by a dual vacuum system. One system serves the superheater furnace and the other the reheater furnace.

The vacuum systems transport ash to a 1,000-ton storage silo 600 ft south of the main building. The two vacuum systems can be oper-

INDOOR TYPE CONSTRUCTION was used but precipitators and ID fans are outdoors. Stack for unit is 450 ft high stacks for units 1 and 2 only 350 ft high



ated simultaneously. Combined removal capacity of the two is 70 tons per hr.

Crossover piping connections permit either system to remove fly ash from either furnace, resulting in a reduced rate of 35 tons per hr. This arrangement permits maintenance work on one system while the other system removes the fly ash. At the silo, fly ash can be discharged dry or conditioned into railroad cars or trucks.

Wet-type ash hoppers were installed under the furnaces. An ash sluicing system removes ash from the hoppers to two 150-ton capacity overhead dewatering bins adjacent to the 1,000-ton fly ash storage silo. At the dewatering bins this bottom ash can be handled by truck or railroad cars.

A two-way car puller between the fly ash storage silo and the bottom ash dewatering bins permits the operator to spot railroad cars for removal of either type of ash.

Structures Bolted Not Riveted

The structural frame is partially braced and partially rigid frame structure. It is held together with high-tensile-strength bolts rather than conventional riveting. With the bolting technique, erection time was saved, noise was reduced, and labor was secured more easily.

Chimney design was based on wind-tunnel studies made by the University of Michigan. It was built 450 ft high for purposes of stratification of gases. Stacks for Units 1 and 2 at the station are only 350 ft high.

The Unit 3 chimney is built of concrete and has a fire-brick lining. There is a 1-in. layer of insulation between the concrete and the fire brick. The chimney was built on its own foundation. Due to space limitations in the area, it was located astride the track that runs into the service building.

Generation is at 18 kv. The high-pressure generator is rated 143 Mw and the low-pressure generator 132 Mw at 15 psig hydrogen pressure. An 18-kv isolated-phase bus connects the generators to two, 160 Mva, FOA, 138-17.1-kv transformers. The 160-Mw transformers are connected to the 138-kv bus with two 900-MCM ACSR cables per phase. Two 10/12.5-Mva, OA/FA, 17.1-4.16/2.4-kv auxiliary transformers are tapped off the isolated-phase bus.

Disconnecting links in the isolated-phase bus permit isolation of a main transformer. The unit can then be returned to service at reduced capacity.

A voltage regulator generator is connected to the shaft of each of three motor-driven exciters. There are two static networks whose output is switched to the voltage regulator generator associated with the exciter in service. This method avoids the hazard of switching generator current and potential circuits.

Instantaneous-voltage and overcurrent relays protect the generators during the rotor preheating period. These relays are placed in or taken out of service by contacts on the control switch for the 138-kv circuit breaker.

Hydrogen for all units at the station is stored in a remote building and piped to the units. This simplifies storage of the hydrogen cylinders and eliminates the dangers associated with hydrogen storage in the main building.

The boiler control board is equipped with a combination sequential and non-sequential annunciator. There are three parts to the sequential portion, one for the equipment of each furnace and one for equipment associated with both furnaces. In the sequential section a flashing light announces the first abnormal condition and non-flashing lights subsequent abnormal conditions.

There are three sections of the 4.16-kv auxiliary bus. They are tied together with bus-tie breakers.

The center or reserve section is fed from a reserve source. The other two sections are fed from unit auxiliary transformers. Transfer from the "normal" to the reserve bus is initiated automatically by bus undervoltage relays.

Under Voltage Trips Bus

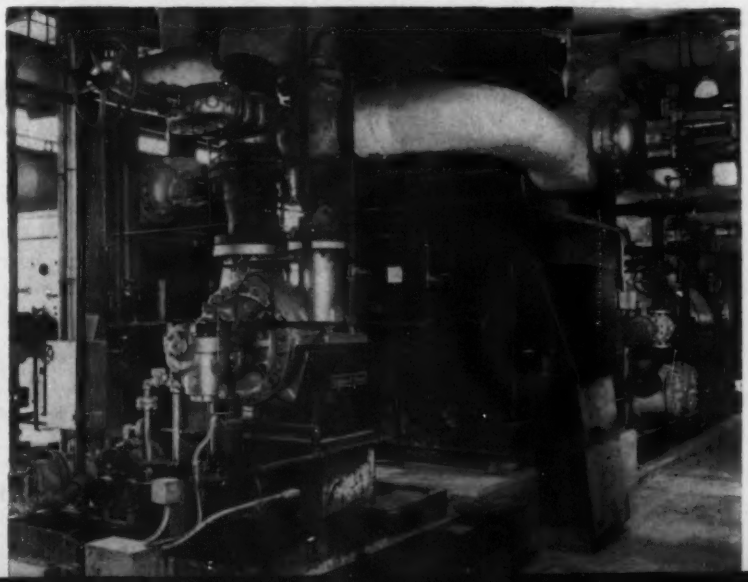
In case of a bus fault, the transfer is restrained by overcurrent relays. The bus undervoltage relays initiate timing relays. If an undervoltage condition exists on a bus section for a predetermined time, the unit auxiliary transformer and non-essential equipment circuit breakers are tripped and the bus tie circuit breaker is closed.

Non-essential equipment consists of air compressors and blowers that can be shut down temporarily to reduce load on the reserve transformer. If bus voltage is not restored by an additional predetermined time, all draft fans, pulverizers, circulating-water pumps and boiler circulating pumps on the bus section are tripped.

Interlocks prevent restart of fuel after loss of flame in the boiler.

Trip relays on the boiler are initiated by the generator-trip relay, turbine stop, and intercept valves, and minimum-load switch. When the boiler is tripped, a selective tripping scheme retains two forced and two induced-draft fans, one low-pressure service pump, one condensate pump, one boiler feed pump, and one circulating-water pump.

SAME MOTOR drives booster and boiler feed pumps. BF pump may run at variable speed through hydraulic coupling while other pump runs at constant speed



Required Ground-Line Diameter for Standing

WAYNE H. JOHNSON, Head Distribution Section, American Gas & Electric Service Corp., New York, N. Y.

Data presented are an aid in determining the required ground-line diameter of standing poles in terms of a summation of transverse wind bending-moment units per foot of span that the pole is supporting.

This method provides a rapid estimation of minimum allowable ground-line dimensions required in a pole life extension program. The term "moment units" is used as a description.

Accompanying tables supply fairly accurate values for Class C and B construction of three kinds of poles. When ground-line dimensions are less than calculated from this method, the pole should be replaced or strengthened at the ground line by stubbing. National Electrical Safety Code allows stressing of poles for Class C construction to 75% of ultimate available stress and Class B construction to 37½% before necessary replacement. These tables take these facts into consideration and provide a method of estimating the required good wood diameter at ground line of tangent poles or unguyed poles in slight angles. These tables do not apply to guyed dead-end poles. Whenever a guyed angle pole is checked it may be assumed the guy will support all of the transverse force due to the angle in

This presentation combines ideas from several sources into a convenient, accurate form.

Table I—"Moment Units" for No. 2/0 AWG to 336,400 CM Line Conductors

(Bare or Weatherproof)

Number of Wires on Pole	Secondary Level; Pole Size, ft				Number of Wires on Pole	Primary and Other Levels; Pole Size, ft										
	25	30	35	40–60		25	30	35	40	45	50	55	60	65	70	75
1	1	1	1	2	1	1	1	2	2	2	2	3	3	3	3	4
2	2	2	3	3	2	2	3	3	4	4	5	5	6	6	7	7
3	3	4	4	5	3	3	4	5	6	6	7	8	8	9	10	11
4	4	5	6	7	4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	5	5	7	8	9	10	12	13	14	15	17	18
6	6	7	9	10	6	6	8	9	11	13	14	16	17	19	20	21
7	7	8	10	12	7			11	13	15	17	18	20	22	23	25
8					8				15	17	19	21	23	25	26	28
9					9				17	19	21	23	25	28	30	32
10					10				18	21	24	26	28	31	33	35
11					11				20	23	26	29	31	34	36	39
12					12				22	25	28	31	34	37	40	42

Table II—"Moment Units" for No. 6 to 1/0 AWG Line Conductors

(Bare or Weatherproof)

Number of Wires on Pole	Secondary and Telephone Levels; Pole Size, ft				Number of Wires on Pole	Primary and Other Levels; Pole Size, ft										
	25	30	35	40–60		25	30	35	40	45	50	55	60	65	70	75
1	1	1	1	2	1	1	1	1	2	2	2	2	3	3	3	3
2	2	2	3	3	2	2	2	3	3	4	4	5	5	5	6	6
3	3	3	4	5	3	3	4	4	5	6	6	7	8	8	9	9
4	3	4	5	6	4	4	5	6	7	7	8	9	10	11	12	12
5	4	5	6	8	5	5	6	7	8	9	10	12	13	14	15	16
6	5	6	8	9	6	6	7	8	10	11	13	14	15	16	18	19
7	6	7	9	10	7				11	13	15	16	18	19	20	22
Telephone					8				13	15	17	18	20	22	23	25
Twisted Pair	1	1	1	1	9				14	17	19	21	23	25	26	28
0.5 in. Cable	1	1	1	1	10				16	18	21	23	25	27	29	31
1 in. Cable	1	1	1	2	11				17	20	23	25	28	30	32	34
1.5 in. Cable	3	3	4	4	12				18	22	25	28	30	33	35	37

Poles is Estimated by This Quick Method

the line. Then the guyed angle pole should have the same ground-line needs as adjacent tangent poles.

"Moment units" of Table I and II are calculated for heavy-loading conditions with wire sizes grouped according to AWG sizes and apply to copper, aluminum or ACSR conductors. In calculating the "moment units" the average loaded conductor diameter of the group is used. Electric circuit and telephone levels are those that occur for average conditions. Secondary levels are at the same height for poles 40 ft and above. Four conductors are allowed at each level, starting from the top for primary, street light or transmission lines. Secondary and telephone levels are assumed to be in their normal position on the pole.

Typical Examples of Balanced and Unbalanced Service Conductors on a Pole

Right side	Left side	Unbalanced
1—3 wire service	No services	3—Conductors
1—3 wire service	From 1 to 3—3 wire services	No Unbalance
1—3 wire service	5—3 wire services	6—Conductors
1—3/c S.D. Cable	From 1 to 3—3/c S.D. Cable	No Unbalance
1—3/c S.D. Cable	4—Triplex S.D. Cables	1—Conductor
1—Tel. Twisted Drop	From 1 to 3—Tel. Twisted Drops	No Unbalance

Note.—When both electric service conductors and telephone drops occur on same pole, calculate unbalanced "moment units" for each type and subtract if unbalances occur on opposite sides of pole. Add if unbalances are on same side of pole.

Table III—"Moment Units" for Unbalanced Service Conductors or Telephone Twisted-Pair Drops

Pole Line Av. Span, ft	100	125	150	175	200	225	250	275	300	300+
"Moment Units" per elec. cond.....	4	3	3	2	2	2	2	2	1	1
"Moment Units" per tel. twisted drop...	1	1	0.5							

EXPLANATION OF TABLE III

Services are frequently arranged on unguyed poles so that forces due to their loaded tension approximately balance each other. However, an appreciable unbalance in forces due to a wide difference in the numbers of services from each side of a pole must be properly considered.

Practical limits allow that one service on one side of a pole will balance up to three services on the other side without consideration of the angle that any of the services make with the line. This applies to electric services as well as telephone twisted pair service drops.

The loaded tension of one Triplex 3/c electric service drop (S.D.) cable creates the same moment on the pole as that caused by one conductor of a 2 or 3-wire open type service. Open wire services and triplex S.D. cables are put in terms of service conductors as:

1—3 wire open type service = 3 Conductors
1—2 wire open type service = 2 Conductors
1—Triplex 3/c S.D. Cable = 1 Conductor

Example of Application

Assume a 40-ft western red cedar pole carrying 150-ft spans, including 4 No. 1/0 copper primaries, 2 No. 6 copper street light conductors, 3 No. 2 copper secondaries, and one 1/2-in. telephone cable, also three service drops—2 telephone (left) and 1 electric triplex SD cable (right).

Step I—Consider wires at primary levels along heaviest lead. Count the number of 2/0 ACSR (or equivalent No. 1 copper) and larger wires (4 in this case), and under Primary Level Pole Size (40 ft) read "Moment Units" ("MU") in Table I (7 in this example).

Step II—Consider smaller wires at primary levels. Count the number of 1/0 ACSR (or equivalent No. 2 copper) and smaller wires (2 in this case) and under Primary Level Pole Size (40 ft) read "MU" in Table II (3 for streetlight wires).

Step III—Proceed as in Steps I and II to get "MU" for Secondary and Telephone Levels, using Table II for 3 No. 2 secondaries, giving 5 "MU," and for one 1/2-in. telephone cable, giving 1 "MU."

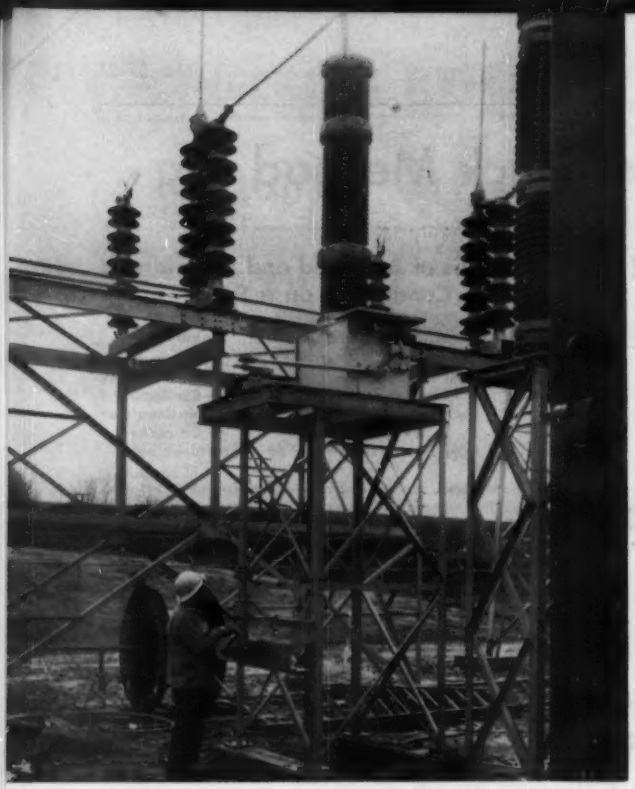
Step IV—Determine "MU" of service drops from Table III (see explanation and examples)—1 triplex SD cable = 1 "MU" (right); 2 telephone drops = 1 "MU" (left); they cancel each other in this example.

Step V—Count wind pressure on 40-ft or larger pole as 1 "MU"; zero on shorter poles (1 "MU" in this case).

Step VI—Count 1 "MU" per distribution transformer (none in this case). Telephone cable terminals, switch boxes and other miscellaneous small items may be omitted from consideration. Consider wires in one span but not in the other at half value.

Step VII—Add "MU" obtained in Steps I-VI, giving 17 in this example, and in Table IV, under 150-ft span, read minimum permissible groundline diameter (9.1 in.) for western red cedar or chestnut poles with grade C construction. For southern pine, the pole could be 9.1 x 0.91 = 8.28 in. in diameter for grade C construction, and 8.28 x 1.26 = 10.43 in. in diameter for grade B construction.

(Continued on page 64)



RELAYING & PROTECTION

Uses High-Speed

Gas-filled switch will close 20,000 amp

C. W. UPTON, Assembled Switchgear and Devices Dept., Westinghouse Electric Corp, East Pittsburgh, Pa.

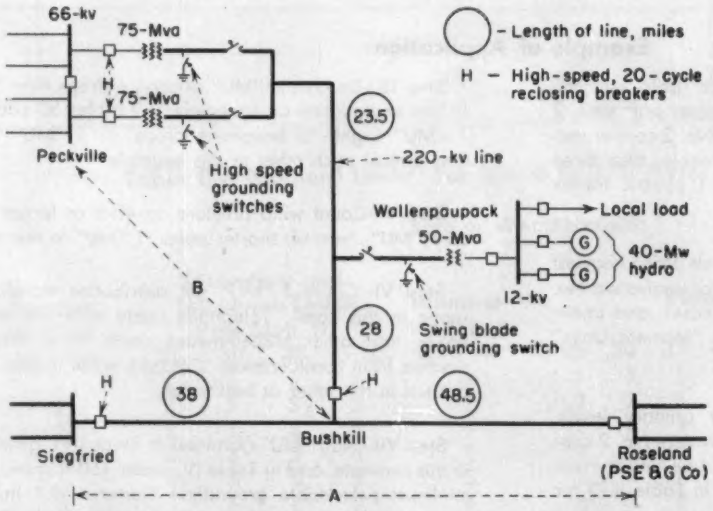
P. HOLTZ, Substation Engineer, and J. A. G. OEWEL, Control Equipment Engineer, Pennsylvania Power & Light Co, Allentown, Pa.

Development of a new high-voltage grounding switch with an operating speed of 4 to 5 cycles provides a means for remote tripping of circuit breakers competitive with present transfer-tripping methods. First application of this switch has been made by Pennsylvania Power & Light Co at its 220-66-kv Peckville Substation to protect power transformers against

HIGH-SPEED GROUNDING SWITCH is tripped by differential relay to protect transformer against any internal faults

Fast Grounding Initiates Remote Tripping

First application of the new high-speed automatic grounding switch has been made on Pennsylvania Power & Light Co's system as shown in the accompanying illustration. This application was first described in a paper by co-author Oewel before the Relay and Electrical Equipment committees of the Pennsylvania Electric Association. The 220-kv line from Bushkill to Wallenpaupack and Peckville is a tap off the important Siegfried-Roseland 220-kv line. This line has carrier-current relays at each of the three terminals. Carrier-current relays are not required for the Bushkill-Peckville line because high-speed relay coverage can be obtained for any transient fault on this line without pilot relaying. Transformers at Wallenpaupack and Peckville have differential relays and high-speed grounding switches on the 220-kv side. At Wallenpaupack, the swing-blade type of grounding switch has been retained. Grounding switches at Peckville are the new high-speed type.



SYSTEM PROTECTION on 220-kv lines of PP&L Co includes carrier-current relaying (A) with third terminal at Bushkill. Instantaneous phase and ground relaying (B) at Peckville and Wallenpaupack overreaches Bushkill breaker

Instantaneous phase and ground relays at Bushkill can be set to cover the line to Peckville

Ground Switch

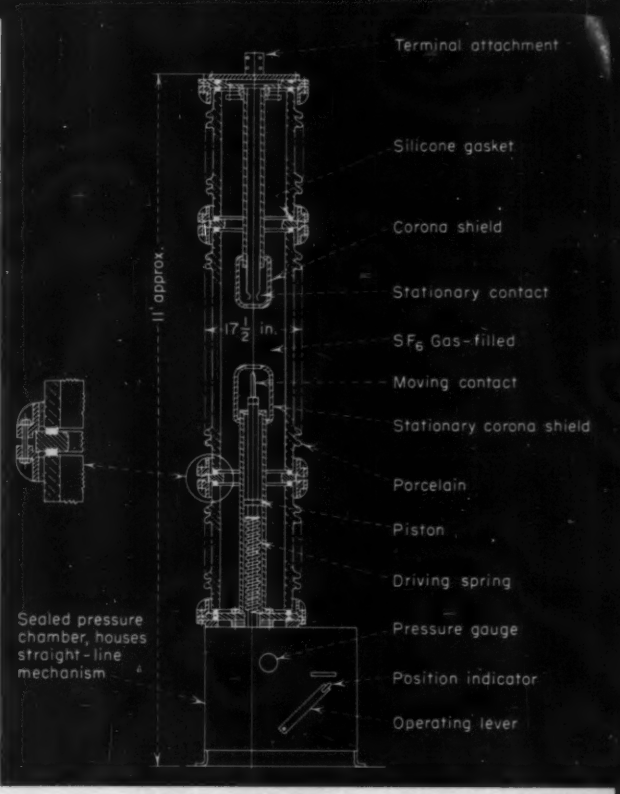
in 5 cycles to protect power transformer

internal faults. Two high-speed grounding switches for 220-kv service have been installed which will close 20,000 amp in 5 cycles.

For this remote tripping application, the grounding switches represent a $40,000 saving over the use of a transfer-tripping scheme. In addition to this substantial saving, it is felt that high speed grounding switches are a more satisfactory and reliable method of remote tripping.

At Peckville Substation, two 220-66-kv, 75-Mva transformers are equipped with differential relays which

(*Continued on next page*)



GAS ATMOSPHERE permits closer spacing of contacts to effect 5-cycle closing time and lessens contact burning

Of Transformer's Circuit Breakers

with adequate margins. They do not reach faults on the Wallenpaupack or Peckville buses because of the intervening transformers. The Siegfried-Roseland line is a source to Wallenpaupack and Peckville. Thus it is not important to keep their breakers closed in event the Siegfried-Roseland line is lost.

Phase and ground relays at Wallenpaupack and Peckville can be set to cover the entire line instantaneously to Bushkill by setting them to over-reach the breaker at Bushkill. These relays will overtrip for certain faults on the Siegfried-Roseland line but this is of little consequence. Since high-speed relay action will be obtained for all transient faults on this line, breakers at Bushkill and Peckville have facilities for high-speed 20-cycle reclosing.

As the Siegfried-Roseland line has carrier relaying, the Siegfried breaker is equipped for 20-cycle reclosing. There will be no overtripping of the Siegfried-Roseland line for faults on the Peckville lines. But a fault on either line which opens breakers at Siegfried, Bushkill, or Peckville will result in high-speed tripping and 20-cycle reclosing of any of the three terminals which open.

Two hydro generators at Wallenpaupack are operated only during peak-load periods or high-water conditions. The line breaker will not be tripped under normal operating conditions. But when either or both generators are operating, the 220-kv line relays will trip the generator breakers, which will not be closed automatically. This applies the benefits of high-speed reclosing to the local load.

Phase and ground relays at Wallenpaupack are set more sensitively than those at Peckville. Should the Peckville terminal open, the Wallenpaupack terminal is certain to open also, when generation is on. This will avoid reclosing on the generators without checking the generators' synchronism.

The high-speed transformer differential relays at Peckville will trip the local 66-kv breaker directly, close the 220-kv grounding switch, and open the 220-kv motor-operated air break switch. Because this switch takes a few seconds to open, the fault will be interrupted by the remote oil circuit breaker first. The local 66-kv breaker will not be reclosed automatically following a differential relay operation.

Opening of the transformer 220-kv air break switch will permit the good line and unfaulted transformer to be restored promptly. A fault within the transformer differential zone, which may be reached by the high-speed relays at Bushkill, will result in transformer differential relay operation in about 1 cycle to insure switching out the faulted transformer.

trip the 66-kv transformer breakers directly. Because there are no high-side breakers at the station, some means was necessary to trip the 220-kv breaker which is some distance away. The choice lay between transfer tripping of the remote breaker or high-speed grounding of the line.

Applicability Factor Evaluated

To evaluate the applicability and reliability of transfer tripping, these factors were considered. Most transfer-tripping schemes use audiotone transmitters and receivers operating over a carrier-current relaying channel or over telephone conductors. Loss of the communication channel thus removes the protection from the transformer. Carrier-current channels frequently are lost during sleet formation on phase conductors and other adverse weather conditions. Channels must be taken out of service periodically for maintenance. These schemes also depend upon the reliability of tone transmitters and receivers and their electronic components.

If a transfer-trip channel is available for some other purpose, the difference in cost over high-speed grounding is not very significant. The choice then should be made on the basis of which scheme provides the greater reliability. At Peckville, no relay carrier-current channel is available to the other end of the line, which is part of an important three-terminal 220-kv line. Thus, a transfer-tripping scheme lacked appeal because of the additional cost of providing the channel.

Switches Are More Reliable

Because of the limited reliability of pilot relay channels, such as pilot-wire channels and carrier-current channels, transmission line relay back-up protection always is provided. This protection must remain in service even though the pilot relays are removed through loss of the controlling channel. By taking advantage of the availability and reliability of this back-up protection, transformer banks which are a part of the line can be protected at all times through the installation of high-speed grounding switches.

Pennsylvania Power & Light Co has had conventional grounding switches of the open swing-blade type in service for several years. The reliability of these switches is conceded to be better than that of transfer-tripping schemes. However, the slow-speed operation of 15 to 30 cycles has been a disadvantage compared with the speed of transfer tripping. Development of a 4 to 5 cycle grounding switch to overcome this disadvantage was desirable. Other requirements considered included safety to maintenance personnel, operating reliability, momentary current-carrying capacity of the contacts, and resistance to contact burning.

Reciprocating Motion Developed

Another factor is the susceptibility of conventional swing-blade switches to icing. In the open horizontal position, the exposed blade can accumulate an ice load heavier than the blade itself. With only a fixed amount of stored energy available to raise and close the blade, the operating speed will be further decreased.

The conventional swing-blade principle obviously could not develop the required speed safely. Therefore, it was decided to develop a reciprocating-blade motion in a sulfur-hexafluoride gas atmosphere. A simplified cross-section of the resulting grounding-switch pole unit is illustrated. The open gap is located symmetrically within the porcelain. The stationary contact assembly is suspended from the top or the live side of the porcelain.

A similar structure houses a reciprocating aluminum blade on the ground side of the open gap.

Stationary rounded and polished corona shields at the ends of the support tubes raise the breakdown voltage across the open gap and permit closer spacing of the contact assembly and reciprocating blade. The circuit to ground is completed when the reciprocating blade thrusts upward to engage the contact assembly and bridge the open gap.

Switch Exempt from Icing

The resulting high-speed grounding switch closes 20,000 amp, is not susceptible to icing, and has a travel time of less than 5 cycles. It has a minimum number of moving parts and withstands repetitive operation with a minimum of maintenance. Sulfur-hexafluoride gas minimizes contact burning and allows the stationary contact and moving blade to be positioned much closer than would be possible in air, thereby minimizing closing time.

The mechanism pressure chamber and porcelain are filled with sulfur-hexafluoride gas at 30 psig. As the pole unit is designed to operate at 15 psig, a factor of safety is provided to accommodate molecular migration and diffusion of the gas through the gaskets.

At Peckville, two pressure switches are installed, one of which makes the pole unit fail safe in case of a fractured porcelain and sudden loss of gas. This switch closes at about 12 psig. It energizes the grounding-switch trip coil, thereby closing the switch while there is sufficient gas to handle the full rating. The other switch will close at about 18 psig to send an alarm by supervisory control to the dispatch board. Switchmen can be dispatched to investigate and remove the unit in an orderly manner should gas pressure continue to drop. As part of the overall reliability of the grounding switch, maintenance will be simpler than that of transfer-trip equipment.

Single-Phase Switch Best

Operation of the high-speed grounding switch will put a phase-to-ground fault on the system. This is a rather easy fault for the system to take because it is only a single phase-to-ground fault, usually at a remote point. In addition, because transformer faults are quite rare, these additional faults on the system should be very few.

Nevertheless, incorrect operation of the grounding switch is somewhat less desirable than would be the case for transfer-tripping schemes. Maintenance personnel must be trained in the correct operation of these switches. A 3-phase switch would provide even faster transformer protection, because the voltage would be removed from the fault upon switch closing. But economics and the less severe system shock both favor a single-phase switch.

A General Electric Voltage Regulator Engineer Asks...

WHY UNTANK IT AT ALL?

By D. D. MacCarthy

Manager—Engineering
Voltage Regulator Product Section
General Electric Company

One very important point has been left out of recent discussions on "ease of regulator untanking":

On the average, the General Electric ML-32 step voltage regulator doesn't have to be untanked at all until after 20 to 25 years of service.

This point, I think, is important because it tends to put this "ease of untanking" feature in its proper perspective.

Whereas we design the ML-32 to be reasonably easy to untank, this is not our primary interest. We believe that a regulator should be on the line "open for business" rather than off the line "open for repairs."

Here are six of the many *exclusive* G-E features we build into the ML-32 to make untanking a seldom-needed thing:

1. *Tap Leads* are brought directly to the tap switch, thus eliminating about 20 connections in the power circuit.

2. *Internal Thyrite* by-pass resistor* is closely coordinated with series winding insulation for maximum protection. Since it is an *internal* by-pass it is not subject to external damage.

3. *Switch insulation strike and creep distances* are more conservative than other regulators. Moreover . . .

4. *Electrostatic shielding* prevents excessive carbon accumulation at critical points on insulating panels. This means long insulation life, even in carbonized oil.

5. *Optimum-life switching,* with speed controlled by impeller, gives extra-long switch life. Arconite switch contacts are of ample size for long life.

G.E.'s ML-32 is designed for 20 to 25 years of dependable, on-the-line service.

6. *Spring-driven Geneva-gear switch drive* has the simplest construction of any regulator. This means fewer parts to cause trouble.

As a further testimonial to the ML-32's mechanical and electrical strength, G.E. is, to my knowledge, the only manufacturer who guarantees a successful tap change under short circuits—including a guarantee of withstanding short-circuit forces at all load-bonus positions.

So, although I agree it's a good thing to take a regulator apart every couple of decades, I still ask: "Until then, why untank it at all?"

For more information, write Section 423-20, General Electric Co., Schenectady 5, N.Y., or contact your General Electric sales office or agent.

**Reg. Trade-mark of General Electric Company*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Valve or expulsion arrester . . . which should you buy?

GET THE BEST OF BOTH IN G-E's MAGNE-VALVE

EXTENSIVE TESTS have made it apparent that neither expulsion nor conventional valve-type arresters offer all the qualities desired in a distribution arrester.

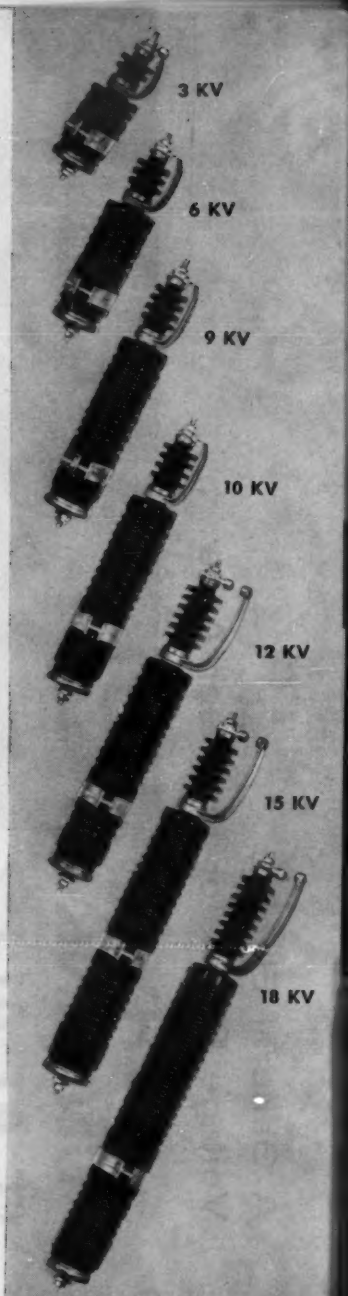
GENERAL ELECTRIC'S THYRITE* MAGNE-VALVE DISTRIBUTION ARRESTER was designed to combine the good and eliminate the poor features of both types. Since 1953, the performance of several hundred thousand units has proven the effectiveness of the Magne-valve design.

MAGNE-VALVE'S superior performance—illustrated by the chart below—affords the highest degree of protection available for distribution circuits.

**Reg. trade-mark of General Electric for molded resistance material.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

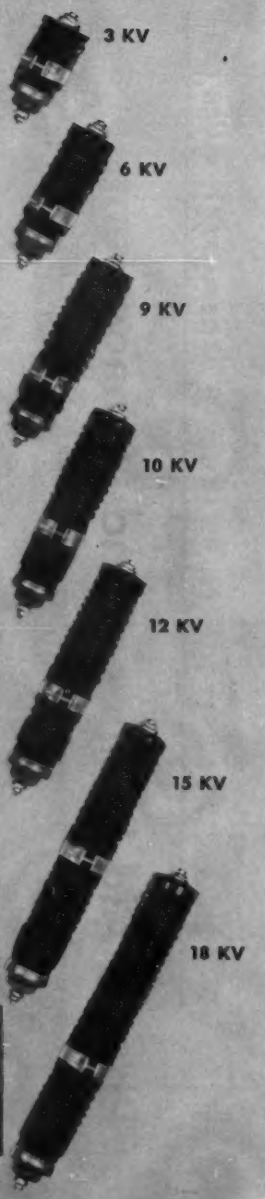


COMPARISON OF ARRESTER CHARACTERISTICS*

	EXPULSION	CONVENTIONAL VALVE-TYPE	MAGNE-VALVE
PROTECTIVE CHARACTERISTICS			
Impulse Sparkover	High	Low	Low
Discharge Voltage	Negligible	Moderate	Low
WITHSTAND CHARACTERISTICS			
High Current Discharge Capacity	65,000-100,000 Amps	65,000-100,000 Amps	100,000 Amps
Long Duration Capacity (2000 micro-second test)	Over 200 Amps	Up to 200 Amps	Over 200 Amps
Duty Cycle Test Required By Industry Standards	(5) shots	(20) shots	(20) shots
APPLICATION			
High Power-Follow Current Areas	Unsuitable because of fiber erosion	No limitation due to available system current	
High Lightning Exposure	Suitable if follow current low	Limited by discharge capacity	Suitable in all areas

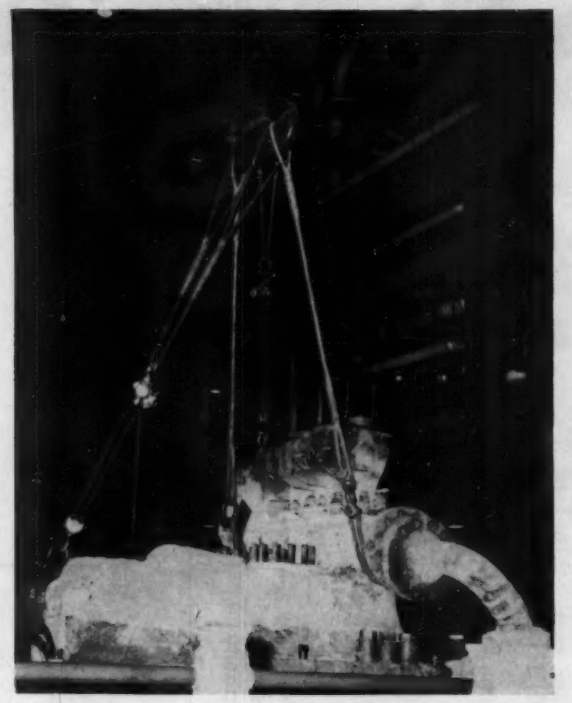
*FOR A COMPLETE ANALYSIS of the relative performance of different types of distribution arresters, contact your nearest Apparatus Sales Office or send for GER1430, General Electric Company, Section 432-28, Schenectady 5, New York.

A complete line of externally-gapped and directly-connected arresters provides positive line lockout protection for universal applications on your system.



Photos Aid Engineers and Management

R. C. DIETRICH, Safety Supervisor, Twin Branch Plant, Indiana & Michigan Electric Co, Mishawaka, Ind.



Shows How Cable Hitch is Made . . .

Reveals Cracks in Wall

Photographs, properly used, serve a variety of purposes in the everyday operation and management of public utilities. They are an economical source of accurate information on various situations for administrative heads and men working under them. Showing existing situations or what has been done, photos are a guide to future work, helping in laying out specific jobs and engineering projects. Plant management can use photography for recording past performance, working procedures, damaged or worn materials, material-handling methods, and safety practices. Photos can be evidence in claims for damages to insured equipment. They can be used in the preparation of operating and maintenance manuals, engineering and management reports, as training aids, or in the publishing of company news.

A photo can give accurate information on the extent of a crack in a turbine wheel shroud ring or of deterioration of a building wall. It can show the manner of making a specific cable hitch. Photography can make reduced-size copies of blueprints. Fragile but valuable old drawings and tracings can be photographed and preserved as prints.

A picture once taken should be dated immediately, assigned a number, labeled with the reason for taking it, and identified as to what and where the object is. It is advantageous to establish a photo file, preferably two—one in numerical order, the other according to subject.

Files prove especially useful in the location of a picture taken years earlier.

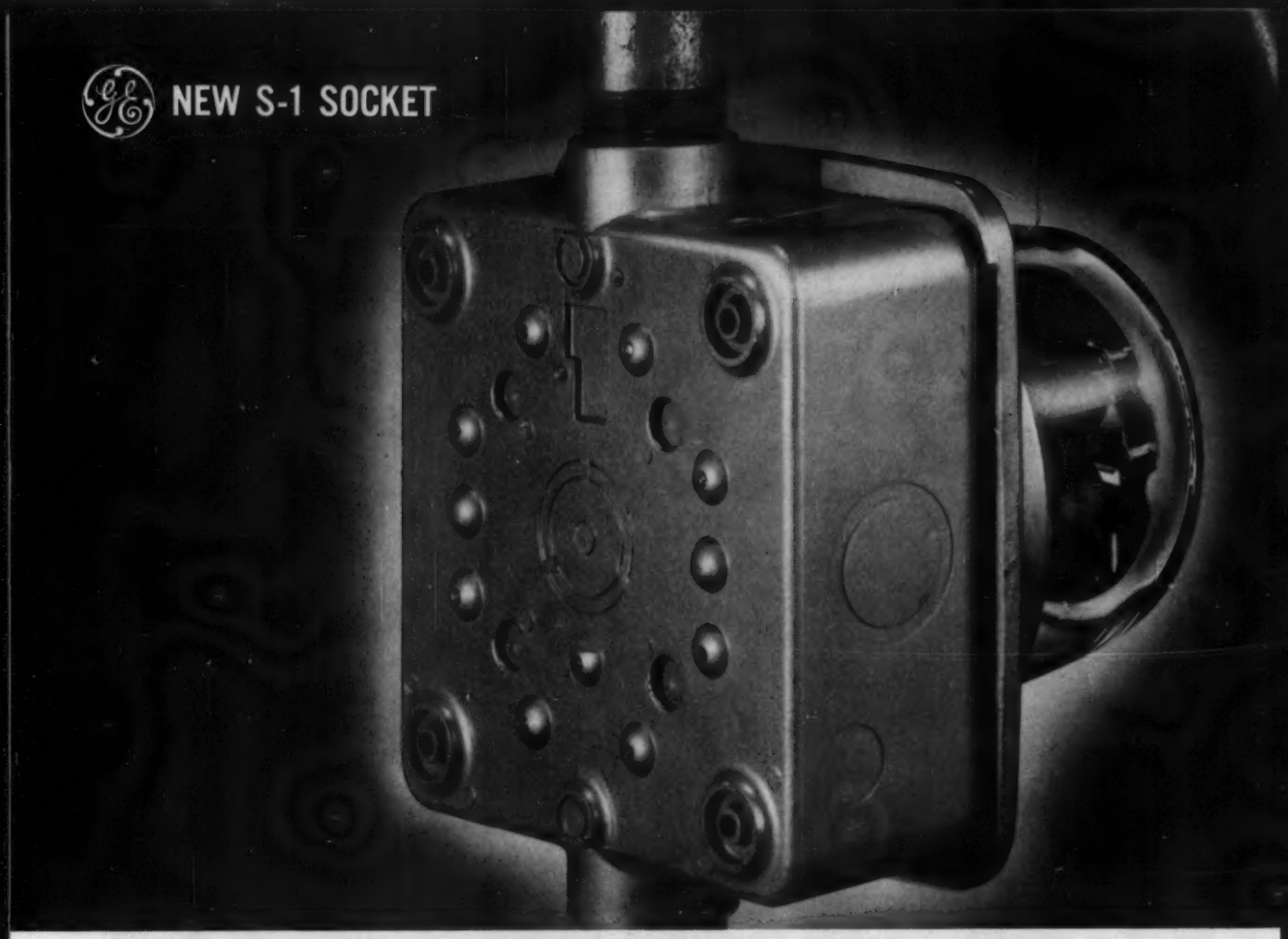
Color Photos Should Be Considered

A professional industrial photographer may be needed for some pictures. When one is employed, arrangements should be made for the purchase of negatives which otherwise might not be available when additional prints are required.

Indiana & Michigan Electric Co takes most of its plant photographs with a 4x5 press camera or a 35-mm candid camera. Both have interchangeable lenses, flash-light accessories, tripods, a miscellaneous selection of filters, and two or more 50-ft extension cords for flood or spot lights.

When thousands of prints are needed each year, the overall costs of processing them privately should be compared with processing by commercial establishments, so that the cost per print can be kept within economic bounds. This company held this cost under 50¢ per 8 x 10 glossy print through the use of its own small photo developing, enlarging, and printing laboratory.

As color photos often reveal more than black-and-white prints, they should be considered in the recording of equipment damage.



Let's Look at Metering This Way...

BEHIND A QUALITY METER SHOULD BE PROTECTION BY A QUALITY SOCKET. THAT'S WHY GENERAL ELECTRIC DESIGNED THE NEW, IMPROVED S-1 SOCKET OFFERING YOU SEVEN IMPORTANT BENEFITS TO HELP METER PERFORMANCE.

The best possible protection is needed for your important metering investment. That's what you look for in a watthour meter socket. Now, the new, improved General Electric S-1 Square Meter Socket has these big benefits which help give top meter performance:

TRUE VERSATILITY. New S-1 comes with one, two, or no hubs, 1¼ or 1½ inches. Mount vertically or horizontally by simply interchanging terminals 90 degrees. Fifth and sixth terminals are added in seconds with only a screwdriver.

PERFECT KNOCKOUTS. Pre-scoring on both sides provides positive knockout every time. One-way knockouts are located on all sides not having hubs.

EASY WIRING. External hubs, large inside working space and lay-in type terminals, requiring only 45 degree wire bend—all make wiring easier, quicker.

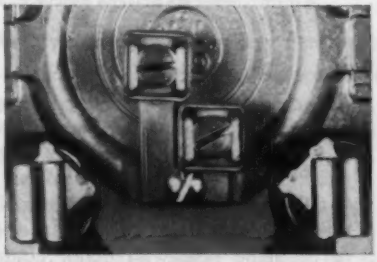
POSITIVE GROUND. You have choice of new lay-in bus-type or serrated strap terminals. Both give positive ground, even with different wire sizes. Bus-type terminal assembly is easily rotated 180 degrees for use of back breakout.

EASY ACCESS. Unique weather-tight snap-lock cover can be removed and replaced in seconds without tools.

100-AMP CAPACITY for growing loads.

HIGH CORROSION RESISTANCE for better all-weather meter protection.

For complete details on the S-1 Socket contact your nearby G-E Apparatus Sales Office or Authorized Distributor . . . or write for bulletin GEA-6563 to General Electric Co., Section 625-5, Schenectady 5, N. Y.



The new S-1 bus-type grounding terminal

GENERAL ELECTRIC

Table IV—Minimum Ground-Line Diameters of W R Cedar or Chestnut Poles for Grade "C" Construction, Heavy-Loading District

Moment Units	Average Span Length, Ft												
	100	125	150	175	200	225	250	275	300	325	350	375	400
1	3.1	3.3	3.5	3.7	3.9	4.0	4.2	4.3	4.4	4.6	4.7	4.8	4.9
2	3.9	4.2	4.4	4.7	4.9	5.1	5.3	5.5	5.6	5.7	5.9	6.0	6.2
3	4.4	4.9	5.1	5.4	5.6	5.8	6.0	6.2	6.4	6.6	6.8	6.9	7.0
4	4.9	5.3	5.6	5.9	6.2	6.4	6.7	6.9	7.0	7.2	7.4	7.6	7.8
5	5.3	5.7	6.0	6.4	6.7	6.9	7.1	7.4	7.6	7.8	8.0	8.2	8.4
6	5.6	6.0	6.4	6.8	7.0	7.3	7.6	7.8	8.2	8.3	8.5	8.7	8.9
7	5.9	6.4	6.8	7.1	7.4	7.7	8.0	8.3	8.5	8.7	9.0	9.2	9.4
8	6.2	6.7	7.0	7.4	7.8	8.2	8.4	8.6	8.9	9.1	9.4	9.6	9.8
9	6.4	6.9	7.3	7.7	8.2	8.4	8.7	8.9	9.2	9.5	9.7	9.9	10.2
10	6.7	7.1	7.6	8.0	8.4	8.7	9.0	9.3	9.6	9.8	10.1	10.3	10.5
11	6.9	7.4	7.8	8.3	8.6	8.9	9.3	9.6	9.9	10.2	10.4	10.6	10.8
12	7.0	7.6	8.2	8.5	8.9	9.2	9.6	9.9	10.2	10.4	10.6	11.0	11.2
13	7.2	7.8	8.3	8.7	9.1	9.5	9.8	10.2	10.4	10.7	11.0	11.3	11.5
14	7.4	8.0	8.5	9.0	9.4	9.7	10.1	10.4	10.6	11.0	11.3	11.6	11.8
15	7.6	8.2	8.7	9.2	9.6	9.9	10.3	10.6	11.0	11.3	11.6	11.8	12.1
16	7.8	8.4	8.9	9.4	9.8	10.2	10.5	10.8	11.2	11.5	11.8	12.1	12.3
17	7.9	8.5	9.1	9.5	10.0	10.4	10.8	11.1	11.4	11.8	12.0	12.3	12.6
18	8.2	8.7	9.2	9.7	10.2	10.6	11.0	11.3	11.6	12.0	12.3	12.6	12.8
19	8.3	8.9	9.4	9.9	10.4	10.8	11.2	11.5	11.8	12.2	12.5	12.8	13.1
20	8.4	9.0	9.6	10.1	10.5	11.0	11.4	11.7	12.1	12.4	12.7	13.0	13.3
21	8.5	9.2	9.7	10.2	10.6	11.2	11.6	11.9	12.3	12.6	12.9	13.2	13.5
22	8.6	9.3	9.9	10.4	10.8	11.3	11.7	12.1	12.4	12.8	13.1	13.4	13.7
23	8.8	9.4	10.0	10.5	11.0	11.5	11.9	12.3	12.6	13.0	13.3	13.6	13.9
24	8.9	9.6	10.2	10.6	11.2	11.6	12.1	12.4	12.8	13.2	13.5	13.8	14.1
25	9.0	9.7	10.3	10.8	11.4	11.8	12.2	12.6	13.0	13.4	13.7	14.0	14.3
26	9.1	9.8	10.4	11.0	11.5	12.0	12.4	12.8	13.2	13.5	13.8	14.2	14.5
27	9.2	9.9	10.6	11.2	11.6	12.1	12.6	13.0	13.3	13.7	14.1	14.4	14.7
28	9.4	10.1	10.6	11.3	11.8	12.3	12.7	13.1	13.5	13.8	14.2	14.6	14.9
29	9.5	10.2	10.8	11.4	11.9	12.4	12.9	13.3	13.6	14.0	14.4	14.7	15.0
30	9.6	10.3	11.0	11.5	12.1	12.6	13.0	13.4	13.8	14.2	14.6	14.9	15.2
32	9.8	10.6	11.2	11.8	12.3	12.8	13.3	13.7	14.1	14.5	14.9	15.2	15.5
34	10.0	10.8	11.4	12.0	12.6	13.1	13.5	14.0	14.4	14.8	15.2	15.5	15.8
36	10.2	11.0	11.6	12.3	12.8	13.3	13.8	14.3	14.7	15.0	15.4	15.8	16.2
38	10.4	11.2	11.8	12.5	13.1	13.6	14.1	14.5	15.0	15.4	15.7	16.1	16.4
40	10.5	11.4	12.1	12.7	13.3	13.8	14.3	14.8	15.2	15.6	16.0	16.4	16.7
42	10.6	11.6	12.3	12.9	13.5	14.1	14.6	14.9	15.4	15.8	16.2	16.8	17.0
44	10.8	11.7	12.4	13.1	13.7	14.3	14.8	15.2	15.7	16.1	16.5	16.9	17.3
46	11.0	11.9	12.6	13.3	13.9	14.5	15.0	15.5	15.9	16.3	16.7	17.2	17.6
48	11.2	12.1	12.8	13.5	14.1	14.7	15.2	15.7	16.2	16.6	17.0	17.4	17.8
50	11.4	12.2	13.0	13.7	14.3	14.9	15.4	15.9	16.4	16.8	17.6	17.6	18.0

Notes:
For Grade B construction, multiply pole diameter by 1.26.
For Southern Pine poles multiply pole diameter by 0.91.
If circumferences are required multiply values by 3.1416.

Data in Table IV are based on western red cedar or chestnut poles, grade C construction, and heavy loading, but conversion factors are given for grade B construction and southern pine poles.

Class B construction is required over all railroads. Consider open-wire lines of 5 kv or higher crossing over or on same pole with major communication lines as Class B. Consider all other construction as Class C. Class N lines usually become Class C with increase of primary voltage or addition of secondaries.

External rot pockets at the ground line shall be subtracted from the effective diameter of the pole.

Poles with "hollow hearts" should not be continued in service for Class B lines. However, hollow hearts that leave a 3-in. shell of good wood are permitted for Class C lines. Neglect this hollow heart when calculating the required pole diameter.

Where pin spacing does not exceed 15 in., the required strength of supporting structures carrying more than 10 conductors, not including telephone cables, may be calculated on ⅔ the total number of wires with a minimum of 10 wires.

BUILT TO TAKE A BEATING!

VICTOR Stacking Units are engineered to withstand extreme service conditions. Starting with proven design, VICTOR Apparatus Insulators are manufactured and tested with the industry's most modern equipment.

Purified Porcelain, coated with scientifically fitted glaze, gives these insulators maximum strength and service life. Utmost precision of manufacture and accurate alignment are attained by assembling shells with cap and pin in tempered, cast iron jigs. Components are carefully joined with a premium grade of insulator cement. Each insulator is tested mechanically, then subjected to vigorous high frequency and 60-cycle flashover. They are designed to withstand steep front impulse waves in addition to the normal 1.5 x 40 standard impulse wave.

Accuracy, ruggedness and exceptional service characterize VICTOR Apparatus Insulators. You just can't buy better stacking units—at any price!

Nothing beats Porcelain **FOR ELECTRICAL INSULATORS!**

VICTOR INSULATORS DIVISION

I-T-E CIRCUIT BREAKER CO., INC. • VICTOR, N.Y.

BEFORE—St. Albans, Vt., had an incandescent system of 70 units to light its business district. Intensity was 0.25 ft-c

AFTER—Intensity is up to 1.20 ft-c with the new 49-unit fluorescent system, reportedly the largest of its kind in the state

City Ups Its Lighting 500%, Gets "New Look"

Stressing increased safety, fine appearance, and traffic convenience, Central Vermont Public Service Corp convinced the city fathers of St. Albans of the need for better downtown street lighting.

Result: citizens of St. Albans are proud of having the largest fluorescent highway lighting system in the Green Mountain State. Light intensity in the downtown section of the city has increased from 0.25 to 1.20 ft-c.

This improvement was wrought by installing 49 brand new fluorescent street lighting units of about 22,000 lumens each in the business section, and several 20,000-lumen mercury vapor lamps at street intersections which had been the most hazardous.

The old lighting system, an "ornamental" incandescent outfit with 70 units, has been retired.

In the interest of economy overhead wiring was used for the new lights, even though the system replaced had underground supply.

Radio Plugs Housepower; Contest Will Spark '58 Promotion

Radio, a two-color booklet, and a $100,000 contest are joining the media that will carry the 1958 "Housepower" message to American home-owners.

"Housepower" has already taken to the airwaves to push on with the campaign for better wiring. A 25-minute show, "Nightline", led off the campaign October 17. A series of 5-min. spots on NBC's "Monitor" will follow up until November 17.

Edison Electric Institute's Wiring Promotion Committee chairman, E. O. George, urged local tie-in with the national program as he explained the details over a nation-wide closed-circuit radio hook-up September 25.

Five Spots on NBC's 'Monitor'

Five-minute "Bob and Ray" and "Believe It or Not" spots on NBC's "Monitor" will be followed by 1¼-minute national commercials plugging the "Housepower" theme. The one-minute spots following this have been reserved for purchase from local NBC radio stations.

Mr. George emphasized that the radio promotion will make the biggest impact when reinforced by local action. A folio of the one-minute spots is available from EEI.

Looking farther ahead, EEI also announced that its 1958 program for "Housepower" promotion would center around a $100,000 contest and a 20-page, two-color booklet.

First out of the gate will be the contest. Beginning during "National Electrical Week" (February 9-15), it will have as its theme "Write a Caption for this Cartoon." Cartoon will show a situation involving low house-power. Advertisements in major consumer publications will publicize the contest.

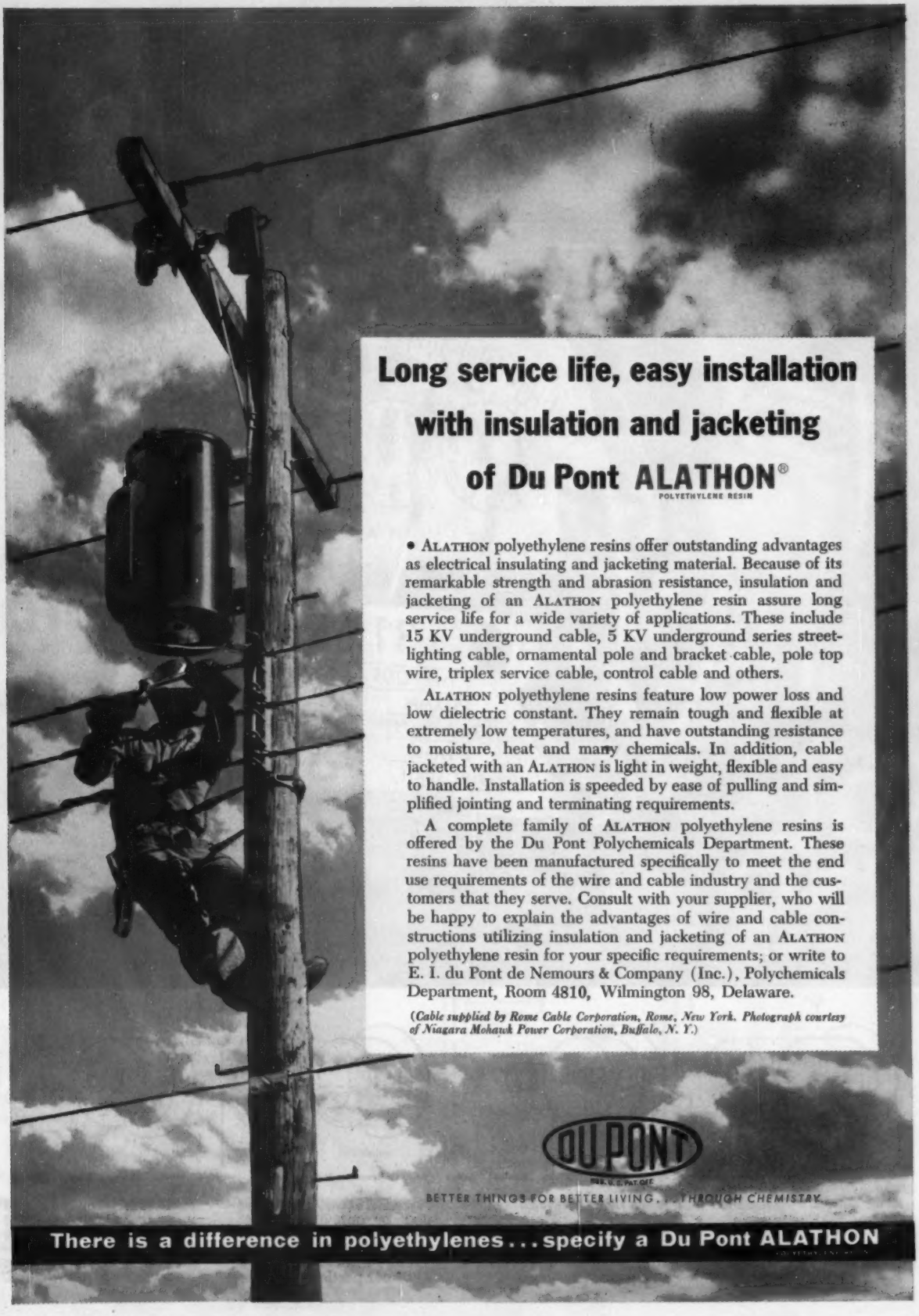
Next fall the two-color booklet, "How to Plan for Better Living with Housepower" will take over the spotlight. The booklet will be offered free to readers through advertisements in national magazines. Electrical contractors, dealers, and utilities will be furnished with advertising display kits to help them tie in their own promotion with the national "Housepower" program.

GE Outdoor Lighting Dept Realigns Marketing Team

The marketing organization of General Electric's Outdoor Lighting Dept, Hendersonville, N. C., was reorganized recently.

The realignment, says Henry J. Channon, the department's marketing manager, "will enable us to work more closely with our field sales force." He points out that the new organization is patterned after that of the company's Apparatus Sales Division.

(*More Selling on page* 70)



Long service life, easy installation with insulation and jacketing of Du Pont ALATHON®

POLYETHYLENE RESIN

• ALATHON polyethylene resins offer outstanding advantages as electrical insulating and jacketing material. Because of its remarkable strength and abrasion resistance, insulation and jacketing of an ALATHON polyethylene resin assure long service life for a wide variety of applications. These include 15 KV underground cable, 5 KV underground series street-lighting cable, ornamental pole and bracket cable, pole top wire, triplex service cable, control cable and others.

ALATHON polyethylene resins feature low power loss and low dielectric constant. They remain tough and flexible at extremely low temperatures, and have outstanding resistance to moisture, heat and many chemicals. In addition, cable jacketed with an ALATHON is light in weight, flexible and easy to handle. Installation is speeded by ease of pulling and simplified jointing and terminating requirements.

A complete family of ALATHON polyethylene resins is offered by the Du Pont Polychemicals Department. These resins have been manufactured specifically to meet the end use requirements of the wire and cable industry and the customers that they serve. Consult with your supplier, who will be happy to explain the advantages of wire and cable constructions utilizing insulation and jacketing of an ALATHON polyethylene resin for your specific requirements; or write to E. I. du Pont de Nemours & Company (Inc.), Polychemicals Department, Room 4810, Wilmington 98, Delaware.

(Cable supplied by Rome Cable Corporation, Rome, New York. Photograph courtesy of Niagara Mohawk Power Corporation, Buffalo, N. Y.)

DU PONT

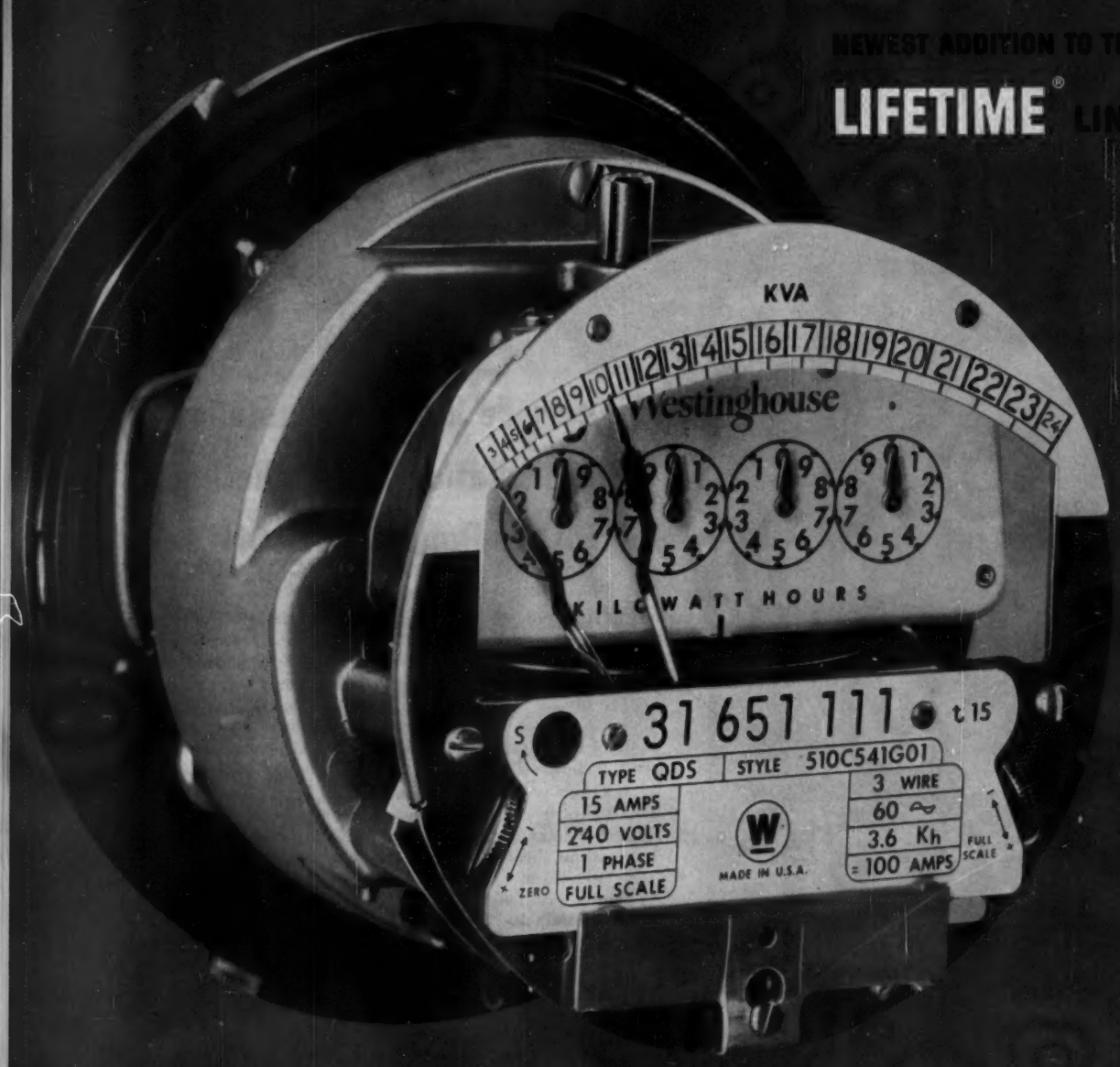
REG. U. S. PAT. OFF.

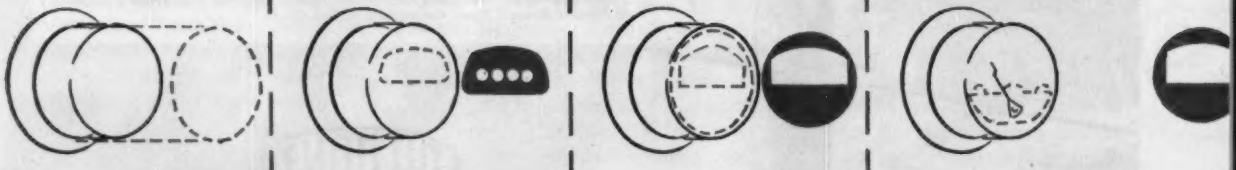
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

There is a difference in polyethylenes . . . specify a Du Pont ALATHON

NEWEST ADDITION TO THE

LIFETIME® LINE





MORE COMPACT—Designed for residential use where there is broad application of low-power-factor appliances. Westinghouse QDS is the smallest thermal demand meter obtainable.

MORE EASILY SERVICED—The standard DS/DA watthour register may be removed for required checking or resetting without disturbing the demand element.

COMPLETE THERMAL UNIT and plate assembly is bayonet mounted—may be removed by loosening only two screws—without disturbing watthour portion.

BLACK POINTER (peak demand indicator) may be reached for checking or replacing silicone lubricant by removing front plate only. Remove only four screws.

NEW, COMPACT, SINGLE-PHASE THERMAL DEMAND METERS

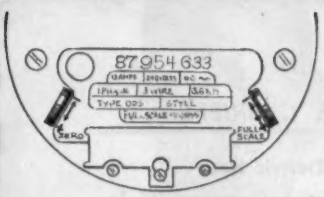
The QDS is a thermal-type ampere demand meter—designed to give you the least possible maintenance—and the closest parallel to heat index of distribution equipment under high-ampere, low-power-factor demand. It is calibrated to show kva demand, which prevents registration losses due to low-power-factor loads. The thermal unit is self-contained, completely sealed, bayonet mounted (with the plate assembly) to the watthour portion. Heater is "wrap-around" type, Chromel Resistance Ribbon. Bi-metal sensors are Midflex 46—stability-proved over years of service. The watthour portion is the performance-proved, 15-ampere (100-ampere extended range) DS meter. Further details and features are outlined on the facing page. A companion model, DSH, is available for kilowatt demand indication.

J-40494

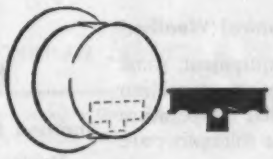
Complete information is available through your Westinghouse sales representative—or meter sales engineer. And there is a sample ready for your complete inspection.

YOU CAN BE SURE...IF IT'S

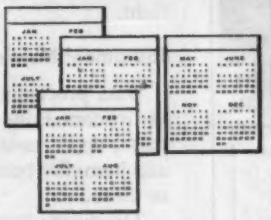
Westinghouse



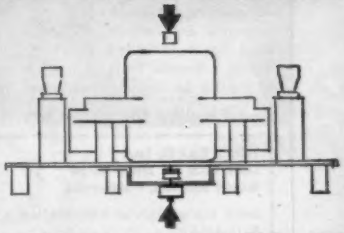
SIMPLE ADJUSTMENT— No tools required. Zero and full-scale adjustments are knurled controls, thumb operated. Note location at left and right edges of plate.



SIMPLE "BADGE" MOUNTING— The Electric Utility identification "badge" or nameplate is provided for with a keyhole slot, single screw mounting on the lower faceplate. Attaching or removing is simple.



SAME TEST SCHEDULE— The same schedule of testing and checking calibration which applies to single-phase DS and DA watthour meters applies to the QDS and the DSH.



BEARINGS FRONT AND REAR— Demand pointers turn on a shaft with silicone lubricated bearing in front and a permanently lubricated bearing at the rear.

INTERESTED IN SAVING THESE?

YOU CAN CUT YOUR MEASURING COSTS IN HALF by using a

Rolatape

MEASURING WHEEL

Have you ever considered how much time you consume in taking measurements for your estimating, layout and job checking work? You can cut that time *at least* in half by using a Rolatape Model 400 Measuring Wheel. Equipped with the Rolatape, *one man* can accurately and easily take measurements at a normal walking speed . . . . and the total is automatically recorded in full view of the operator. These features guarantee a real saving in man-hours and money.

You can measure with confidence when you measure with Rolatape, because accuracy is assured by its scientifically calibrated counting mechanism. Simple to operate, Rolatape measures and records total as it is rolled along. Handle folds compactly for easy storage and handling.

Send today for complete details

ROLATAPE, Inc.
1741 14th St. Dept. E-10
Santa Monica, California

Send me complete information on ROLATAPE:

Name .....
Firm .....
Address .....
City .....
State .....

Detroit Ed Plugs Electric Heat at Meetings

Detroit Edison Co commercial representatives are shown examining an electric heating display at a recent meeting staged by their company for electrical contractors in its area. L to r, they are H. Wainwright, L. Salow, R. Pollack and R. Chambers.

The meeting, following a similar one held for architects and consulting engineers, was to acquaint the contractors with electric heat, how it can be sold, and the utility's policies regarding it. Detroit Ed plans to hold meetings for other interested trade groups from time to time.

Carrier Finds Automation Thrives on Conditioned Air

People are not the only parts of the business world that work better under cool conditions with controlled humidity. According to Carrier Corp, the electronics industry favors air conditioning because their computers work more accurately and last longer when the climate is right.

Equipment Needs Control 'Weather'

Data processing equipment, some of it containing nearly a million parts, needs controlled temperature and humidity because tolerances are so close.

The wrong "weather" in the office can gum up magnetic tape, cut vacuum-tube life in half, and greatly increase the chances of operator error, they say.

The Army's "Bizmac" computer, a 20,000-sq-ft installation in Detroit, depends on air conditioning equipment to carry off 1.8 million Btu per hr when it is wrestling with a problem. Engineers say the mighty machine would have to shut down for repair if it went without conditioned air for as little as 15 seconds.

Cloud Wampler, board chairman of Carrier Corp, summed it up: "Automation is air conditioning's best friend."

H & C BRIEFS

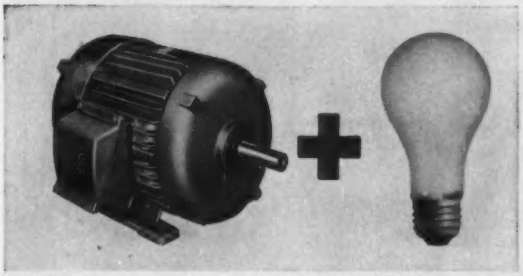
Indiana for Electric Heat

Public Service Company of Indiana is developing plans for active promotion of electric heating in 1958. They have 170 electric heating customers now. Of these, 10% are heat pump customers.

(*More selling on page* 72)

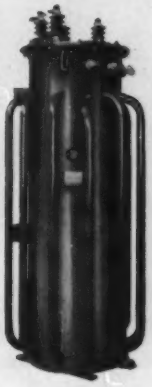
3 ways to get the most out of 3 phase . . .

- *CONVENTIONAL*—for industrial service
- *DUPLEX*—for combination single and three phase service
- *TRIPLEX*—for convenient pole mounting

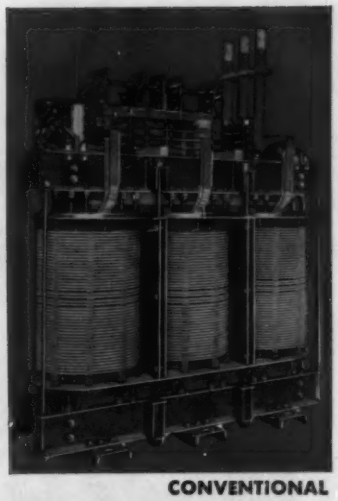


THREE PHASE for heating, air conditioning, motor service.

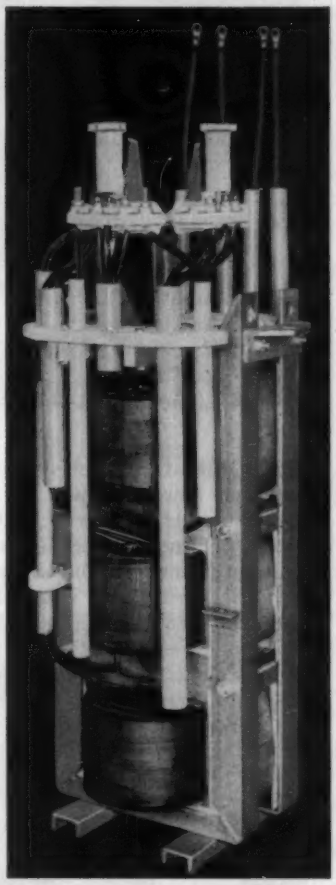
SINGLE PHASE for general lighting service.



DUPLEX



CONVENTIONAL



TRIPLEX

3 basic Kuhlman units designed to meet your 3 phase requirements:

First is the Kuhlman **Conventional** design for industrial or concentrated load areas. It does the job of 3 single phase transformers more economically and makes a neater installation.

Next, Kuhlman features the **Duplex** for combination residential and light industrial loads. This design provides single and three phase service in one compact unit.

Finally, Kuhlman presents "space saver" **Triplex** design which is vertically stacked to match pole contour and reduce bulk for convenient pole mounting.

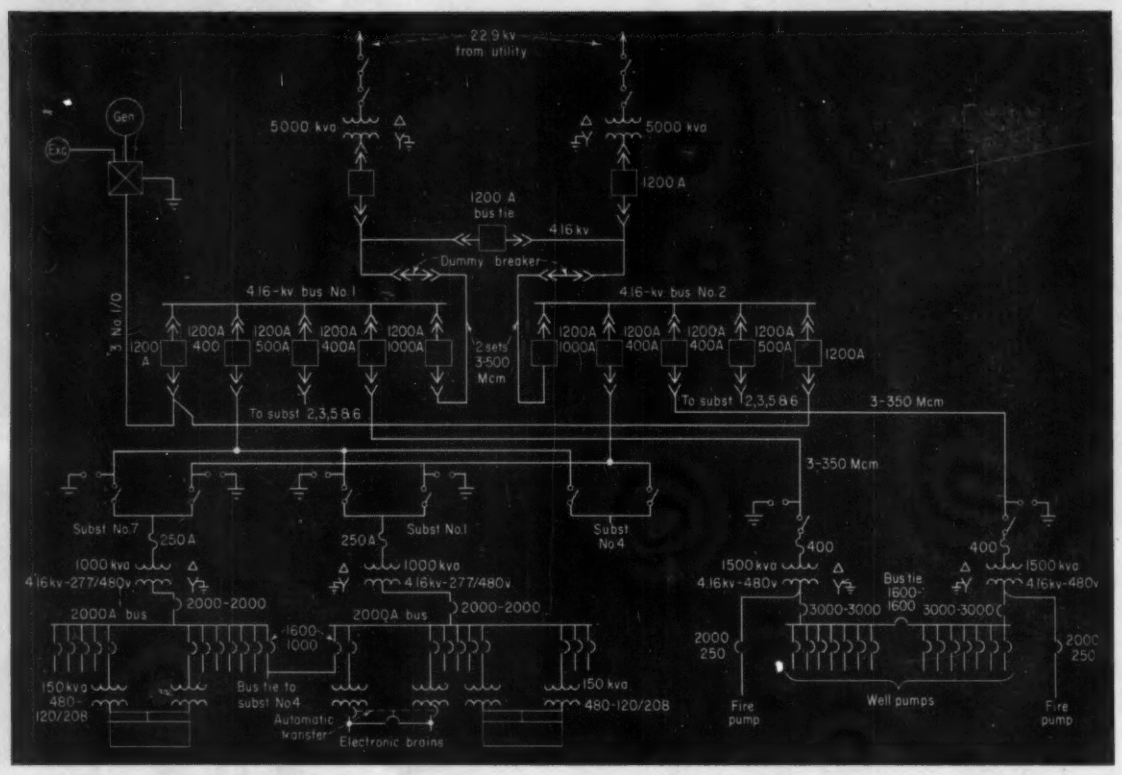
Let your Kuhlman representative, on his next visit, tell you more about *how to get the most out of three phase.*

KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman representative, and are the first one to notify Dept. SA-I, Kuhlman Electric Company, P.O. Box 288, Birmingham, Mich., you will receive a valuable gift.

5717b

KUHLMAN
ELECTRIC COMPANY
GENERAL OFFICES: Birmingham, Michigan



4-kv Distribution Serves New Office Building

A 4.16-kv distribution system and duplicate power facilities are two of the unusual features of the Connecticut General Life Insurance Company's new headquarters building in Hartford, Conn. To avoid any interruption in the highly organized and continuous flow of paper work that characterizes a large modern insurance company, electrical facilities in the 700,000-sq ft office building were designed to handle twice the 6,600-kva connected load.

Power is supplied by Hartford Electric Light Co through two independent 22.9-kv feeders, each sized to carry the full load of the building. The master substation, located about 800 ft from the building, consists of two 5,000-kva transformers which drop the incoming voltage to 4.16 kv for distribution. Each transformer can handle 75% of the total load. Fan cooling provisions boost the capacity of each unit to 6,250 kva. A tie breaker connects the two secondaries.

From each transformer, two sets of three-500 MCM underground feeders, each sized to carry the 5,000-kva demand load, carry power to the master switchgear in the building. In addition, two spare 4-inch conduits for each service run from the substation to the main building.

4 kv Chosen for Economy

The 4.16-kv distribution voltage was selected on the basis of maximum economy. A primary selective distribution system with secondary ties was used to maximize reliability. Main breakers and tie breakers are mechanically interlocked for protection and safety.

Eight substations, with a total capacity of 10,000 kva, reduce the distribution voltage to 277/480 v for the fluorescent lighting and for all motors of ¾ hp or larger. One substation, comprising two 1,500 kva transformers, serves the bulk of the mechanical equipment. Each of the remaining seven substations, all rated 1,000 kva, is in one of the seven service cores in the main building. All substations are located in the basement and have automatic fire detection equipment. For emergency standby, all transformers and secondary ties are sized to handle 80% of the connected load at permissible transformer overloads.

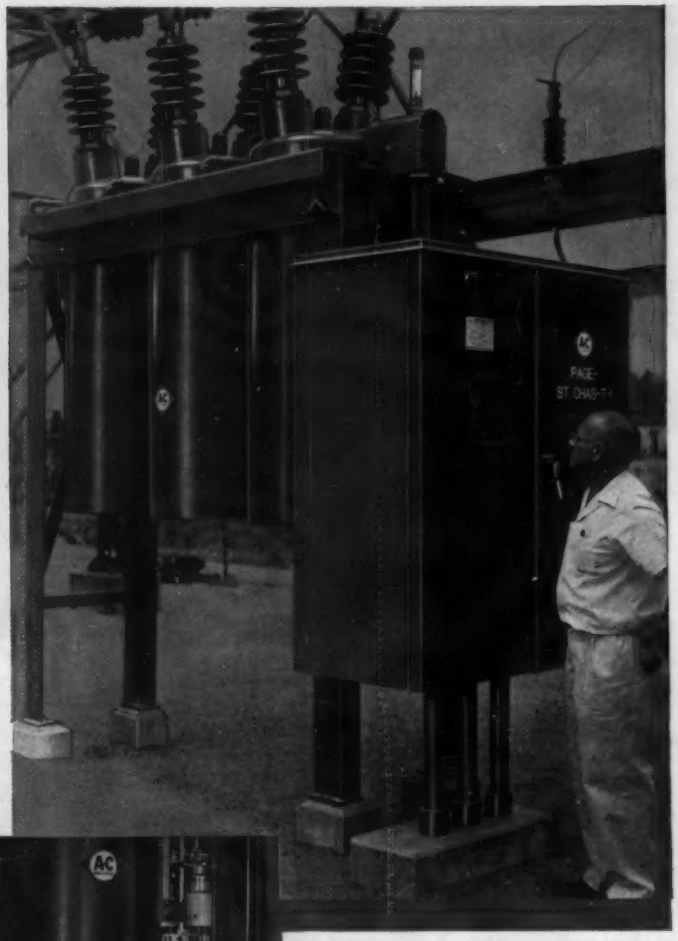
Dry transformers in the substation rooms supply 120/208 v for the incandescent lighting, kitchen equipment, and motors of ½ hp or smaller. Power is distributed through cellular steel floors from the electrical closets serving each floor. Nineteen motor control centers in the building house the controls for fans and other equipment.

A 750-kva diesel generator provides an emergency 4.16-kv service for fire pumps, and essential heating and lighting. The emergency power distribution circuitry was designed to permit use of the lower level of the building as an air raid shelter.

ALLIS-CHALMERS

"F Z O" frame-type breaker

Has 3 Features You Want Most!



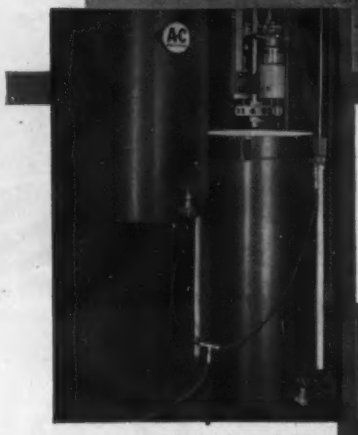
HERE are the outstanding features utilities enjoy with this Allis-Chalmers frame-type breaker.

Pneu-Draulic **operator provides last word in simplicity — ease of inspection — reliability.**

Power-operated hydraulic tank lifter takes all the effort out of raising and lowering tanks — saves time.

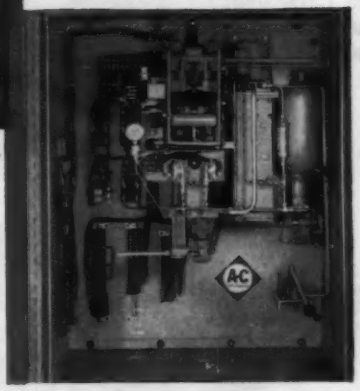
Turbo-Ruptor **interrupting device with self-aligning tulip and bayonet contacts.**

In addition, there are dozens of refinements, such as the side trip . . . new oil sampling device . . . float-type oil gauge . . . external adjustment of overtravel stop . . . ASA standard bushings . . . which make this the finest breaker in the field.



Power-operated hydraulic tank lifter.

Pneu-Draulic operator.



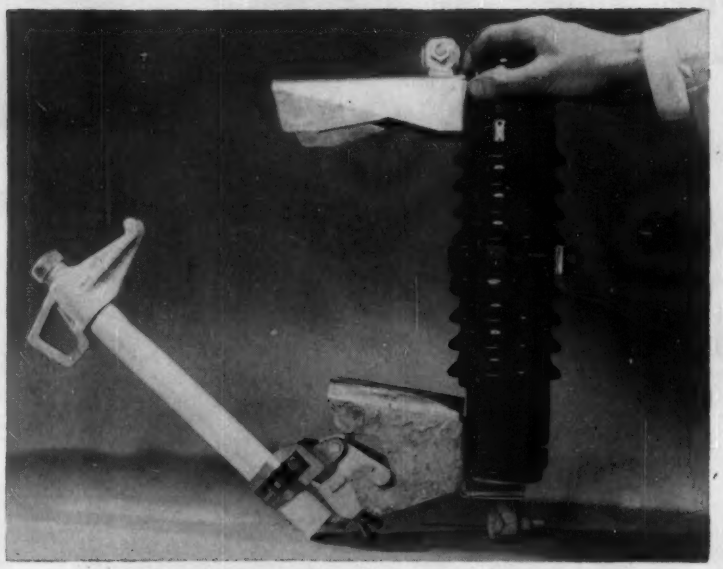
For complete details, call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic and *Turbo-Ruptor* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-5417

NEW EQUIPMENT



Loadbreak Cutout . . .

. . . for extra heavy-duty applications is addition to type DX line. The cutout is available in ratings of 5.2 and 7.8 kv, with fault interruption capacity of 10,000 amp. At 15-kv rating, I.C. is 8,000 amp.

New heavy fuse-tube mounts in same holder with standard and heavy-duty model in same rating. The cutout contains an expandable cap at the top, which melts when pressures inside are too high to escape through the regular aperture.

A new eyebolt terminal has also been included.

Operation is same as other DX cutouts. Available with loadbreak fuse holder if desired.

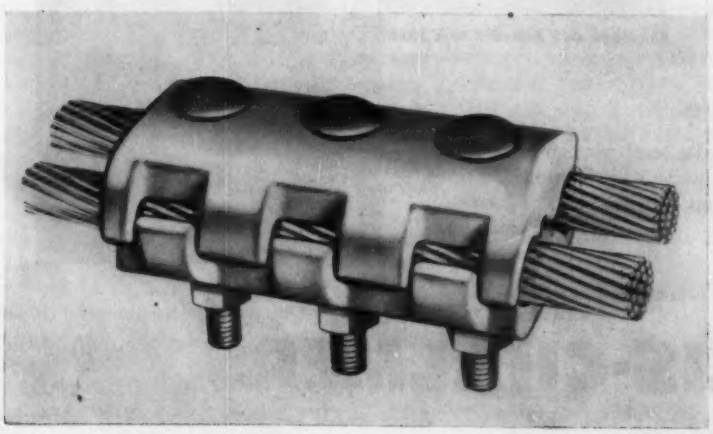
Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

Transformer Tester

. . . checks current transformers rated up to 1,500 amp. The testing equipment includes a precision multirange current transformer for use as the standard of comparison. Two auxiliary instruments are required: a suitable ammeter and a low-capacity zero-center wattmeter.

The type AT-6 "Uniload" current transformer can calibrate other current transformers of the following ratings: 5, 10, 15, 20, 25, 30, 40, 50, 75, 100, 150, 200, 300, 400, 500, 600, 800, 1,000, 1,200, and 1,500 amp.

Knopp Inc, 1307 66th Street, Oakland 8, Calif.



Clamps . . .

. . . of parallel groove type cover No. 6 through 477 Mcm in only four sizes. Cast from heat-treated aluminum alloy for use with ACSR or all-aluminum conductors, they are designed for high mechanical and electrical stress.

Contoured clamp body makes bolts self-aligning and self-centering. Contact surfaces are "bright-dipped" and coated. Available with aluminum or steel hardware, the clamps meet NEMA and REA specifications.

A. B. Chance Co, Centralia, Mo.

(*More New Equipment on page* 76)

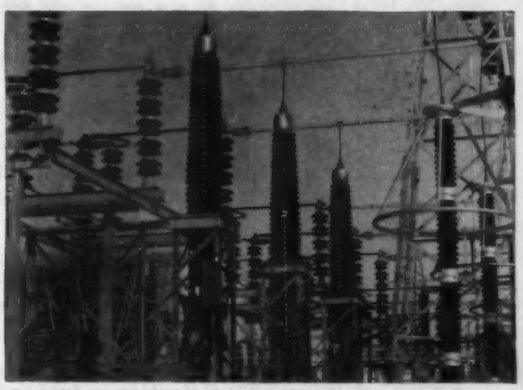
Downstream side of power house at Garrison Dam with transformer banks and 230 Kv. oil pipe cable potheads.

G&W 230Kv. POTHEADS PROVEN IN SERVICE

First in U. S. A. are the G & W Type "ATA" potheads on the 230 Kv. high pressure oil pipe type cables installed in 1955 at the Army Corps of Engineers Garrison Dam on the Missouri River in North Dakota. The 230 Kv. cables connect the main transformer banks for generators 1, 2 and 3 to the 230 Kv. switchyard 1000 feet distant.

Proper treatment of mechanical and electrical stresses permit a simple G & W design. Full 200 pound pipe line oil pressure is retained by the relatively small bore porcelain shell. Tested at 500 p.s.i. pressure. No castings are used for withstand of pressure. Top and bottom fittings are fabricated, non-magnetic, stainless steel—sealed by fully retained "Resistoyl" gaskets. Stress relief cone, supplemented by porcelain stress control tube, makes efficient use of the internal diameter and length of porcelain shell—and reduces the amount of installation labor.

G & W regularly furnishes potheads and joints for oil and gas filled cables, high and low pressure. Full cooperation is given to users and to cable manufacturers with respect to varying details of devices. For example, Type "ATA" (high pressure) and "ATL" (low pressure) potheads can be furnished with current transformers for metering.



230 Kv. potheads in Garrison switchyard where oil pipe cable is brought from power house transformer deck.

G&W ELECTRIC SPECIALTY COMPANY
3500 W. 127th ST., BLUE ISLAND, ILLINOIS

A573

Representatives in many cities of U. S. A., N. & S. America Canadian Mfr. - Powerlite Devices, Ltd., Toronto, Montreal & Vancouver

High Voltage Cable Terminating, Sectionalizing, Protecting, and Connecting Devices

POTHEADS • BOXES • OIL FUSE CUTOUTS • LOAD BREAK OIL SWITCHES • SPLICING KITS

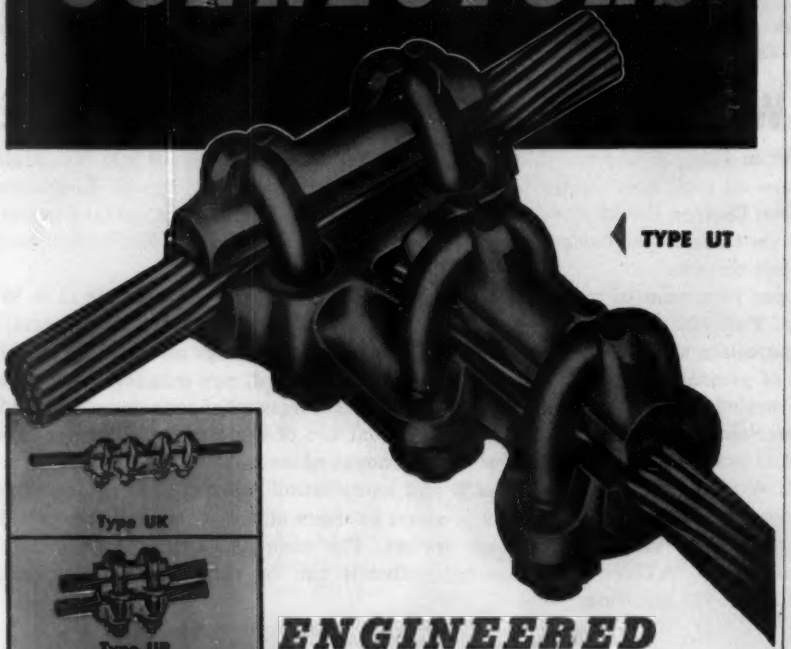
Fast to make fast!

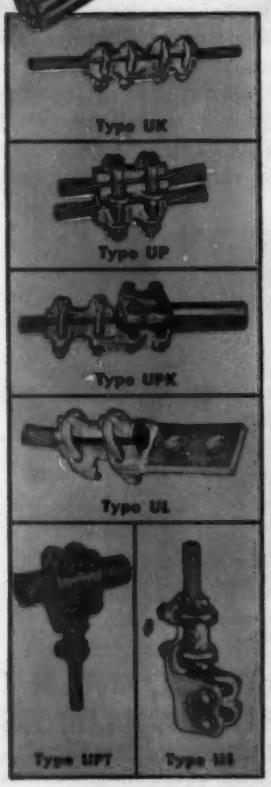
Safe, swift cable connections with

DOSSERT

U-BOLT

CONNECTORS





ENGINEERED FEATURES:

VARIABILITY
Fits many cable sizes, reduces number of connectors needed for given number of combinations of conductors.

HIGH CLAMPING ACTION
U-Bolts clear all conductors by close limits, supported by saddles through their full arcs. Minimizes bending action, makes U-Bolts subject to tensile stress only.

CABLE END RELIEF
Allows for distortion in free ends of strands, ample room for binding end of stranded cable if desired.

CONDUCTIVITY
High copper alloy with sufficient contact area to insure cooler-than-conductor operation under maximum load.

Available for aluminum or aluminum to copper conductors.

Excl. Canadian Distributor: W. S. Gerrie & Assoc. Ltd.
66 Racine Road, Rexdale, Ontario

WRITE FOR DETAILS AND PRICES TODAY!

50 YEARS OF TECHNICAL KNOW-HOW

DOSSERT MFG. CORP.
249 Huron Street, Brooklyn 22, N. Y.

Relay . . .

. . . for over or under speed control requires no external source of power, acts as miniature generator when placed near teeth of gear. Critical speed for the single-pole double-throw relay is set by adjusting spacing between magnetic pick-up and actuating metal. Contacts are rated at 5 amp non-inductive load. Model 3420.

Electro Products Laboratories, Inc, 4500 N. Ravenswood Ave, Chicago 40, Ill.

Ultrasonic Cleaner . . .

. . . in a single cabinet includes heater, temperature control, filtration and recirculation system, and ultrasonic generating equipment. Overall dimensions of model R-50 are 22x19x37 in. Piping, pump, and filter are stainless steel with Teflon gaskets, which can take alkaline solutions, solvents, and mild acids.

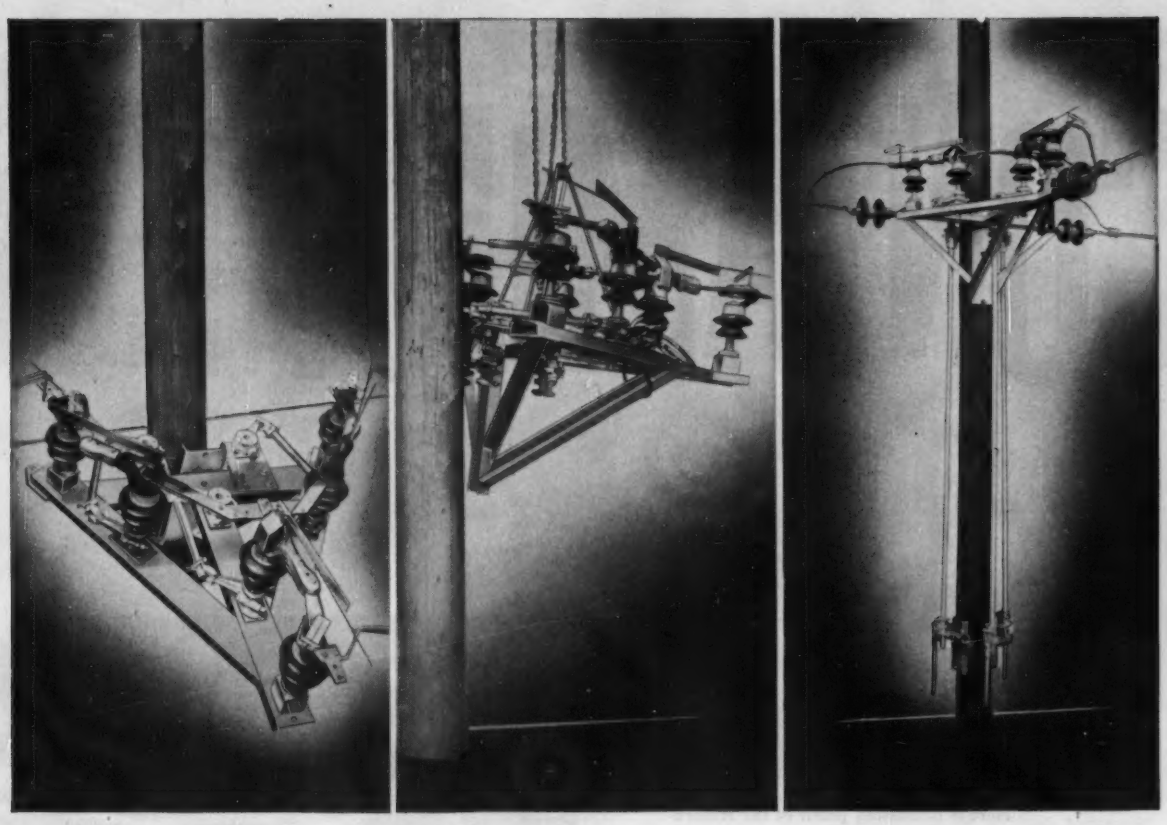
Tank size is 6x16x11 in., with volume of 5 gal. Transducers have rated input of 250 rf w average, converting into mechanical vibrations at 38 kc.

Branson Ultrasonic Corp, 40 Brown House Rd, Stamford, Conn.

Brakemotor . . .

. . . is compact single-frame unit employing disc-type magnetic brakes. Doughnut-shaped magnet allows shaft to extend through. This

(*Continued on page* 80)



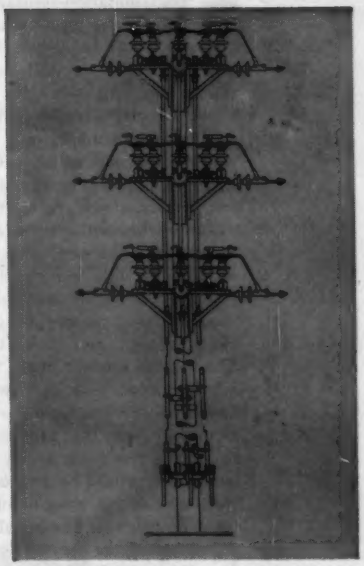
Expansion problems solved quickly with DELTA-STAR Type TH Pole Top Switches

Does time sometimes run short on your expansion projects? Is ground space sometimes at a premium? If you have these or similar problems, you may readily solve them with the installation of Delta-Star Type TH Pole Top Switches.

Installation of Type TH Switches is quick and easy because the switches, bases and frames are mounted as an integral unit. There are no separate units to install. Each switch has a simplified, independent operating mechanism, permitting 3-phase operation from ground level.

Quick-whip arc suppressors eliminate heavy arcing during interruption of line and transformer charging current up to 15 amperes. Standard open gap spacings meet or exceed AIEE and NEMA guarantees.

Type TH Switches can be installed at less than ¾ the cost of conventionally-mounted air switches. It will pay you to check into them soon. Call your nearby Delta-Star representative.



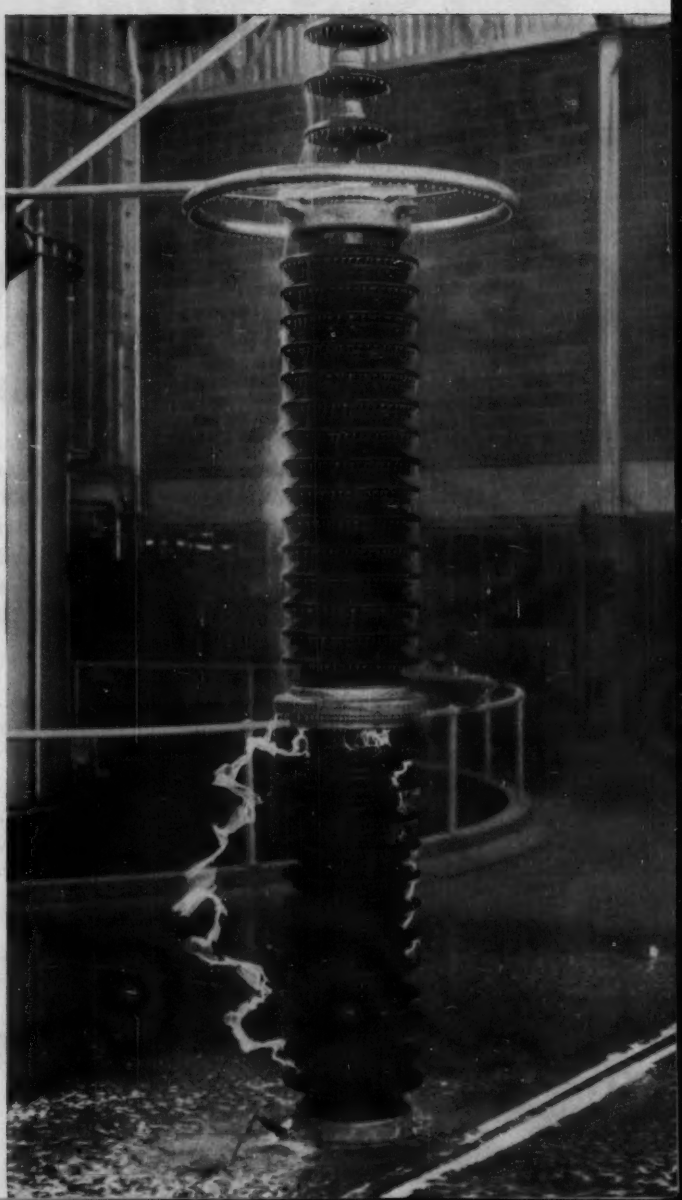
Type TH Pole Top Switches may be obtained for 2-way or 3-way switching, in 400 and 600 ampere ratings, and 7.2 to 69 kv. For complete data, write for Bulletin T-5511.

H. K. PORTER COMPANY, INC.

DELTA-STAR ELECTRIC DIVISION

Divisions of H. K. Porter Company, Inc.: Cleveland, Connors Steel, Delta-Star Electric, Henry Disston, Leschen Wire Rope, Quaker Rubber, Refractories, Riverside-Alloy Metal, Vulcan Crucible Steel, W-S Fittings, H. K. Porter Company (Canada) Ltd.

CONTAMINATION



Here is laboratory proof of the remarkable contamination-resistance of new Thorex Dynagap high voltage arresters. This model for 345-kv service was energized at 276 kv — full line-to-ground rating, and approximately 33 per cent above normal expectancy. Wetting was applied intermittently, and consisted of concentrated salt solution in a wetting agent. This far exceeds standard wet test specifications and is more severe than any known natural surface contamination. The test continued for 12 minutes. In this time, surface leakage was so severe that considerable steam was produced, as can be observed on the upper-left portion of the housing. The entire arrester was "alive" with inter-petticoat discharges, and full open flashover frequently occurred, as the picture shows. The arrester protective circuit did not react in any way to this test, which would be destructive to any multi-unit design long before flashover could be reached. The metal collar near the center of the arrester is entirely on the outer porcelain surface and has no connection with internal parts, thus producing a functionally one-piece housing.

Effectively controlled by new

THOREX Dynagap high voltage lightning arresters

A new and effective measure to combat contamination is offered in Thorex Dynagap high voltage lightning arresters. Leakage currents stay on the outside where they are harmless.

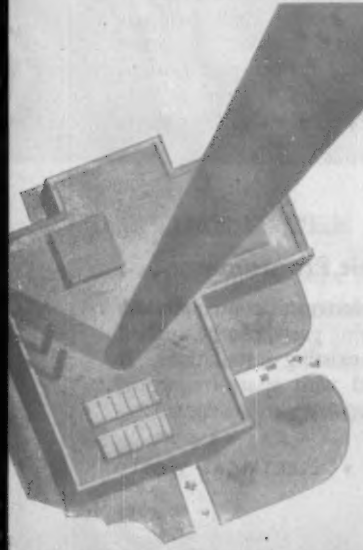
These new arresters use functionally one-piece housings. There are no stacking units and, therefore, no stacking unit connections. Surface leakage currents cannot enter the sensitive internal arrester circuit at intermediate points and, therefore, cannot have the effect of shorting-out one or more units. This has been a major cause of high voltage arrester failures and is now completely eliminated in modern Thorex Dynagap design.

Since industrial contamination is either present, or certainly likely, in most principal station locations today, be sure your arrester protection carries the added insurance of immunity to this common operating problem.

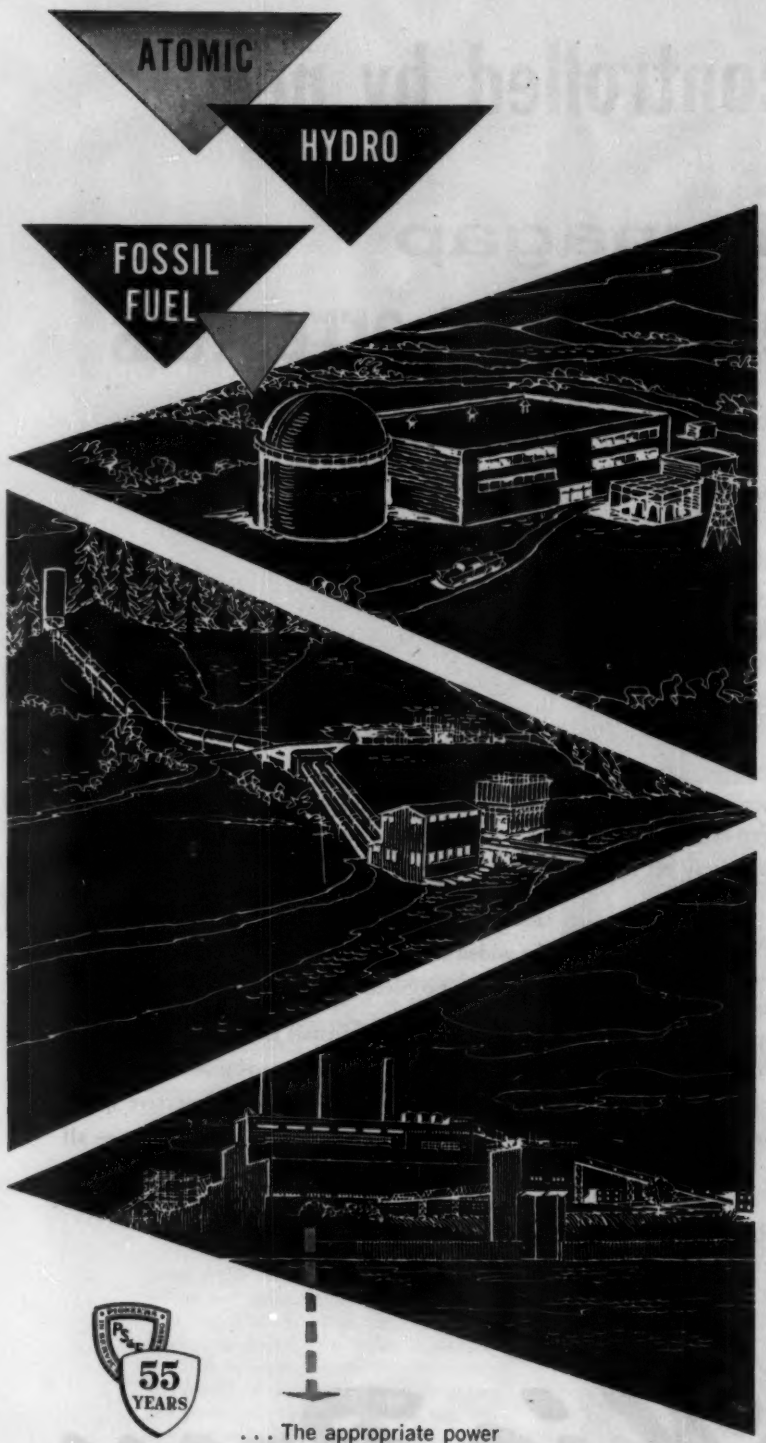
— and when you install new Thorex Dynagap station class MPR arresters, you will get other unique improvements: superior protective qualities and unheard-of surge current durability — all at an attractively low installed cost.

OHIO BRASS COMPANY • MANSFIELD, OHIO

4780-H



Ohio Brass



55 YEARS

. . . The appropriate power
for your expanding program

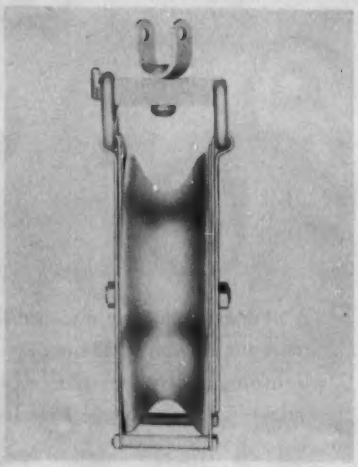
Send for our descriptive booklet, "Pioneering New Horizons" of these and other services.

Pioneer Service & Engineering Co.
231 South La Salle Street • Chicago, Illinois

Brakemotor

(*Continued from page* 76)

feature permits mounting on input or output sides of gears or fluid couplings. Drive motors are available in NEMA frame sizes 182-326U, drip-proof or totally enclosed. Brake operating ratings are 3, 6, 10, 15, 25, and 50 ft-lb continuous duty, and 3, 6, 10, 15, 25, 35, 50, and 75 ft-lb intermittent.
Reuland Electric Co, Alhambra, Cal.



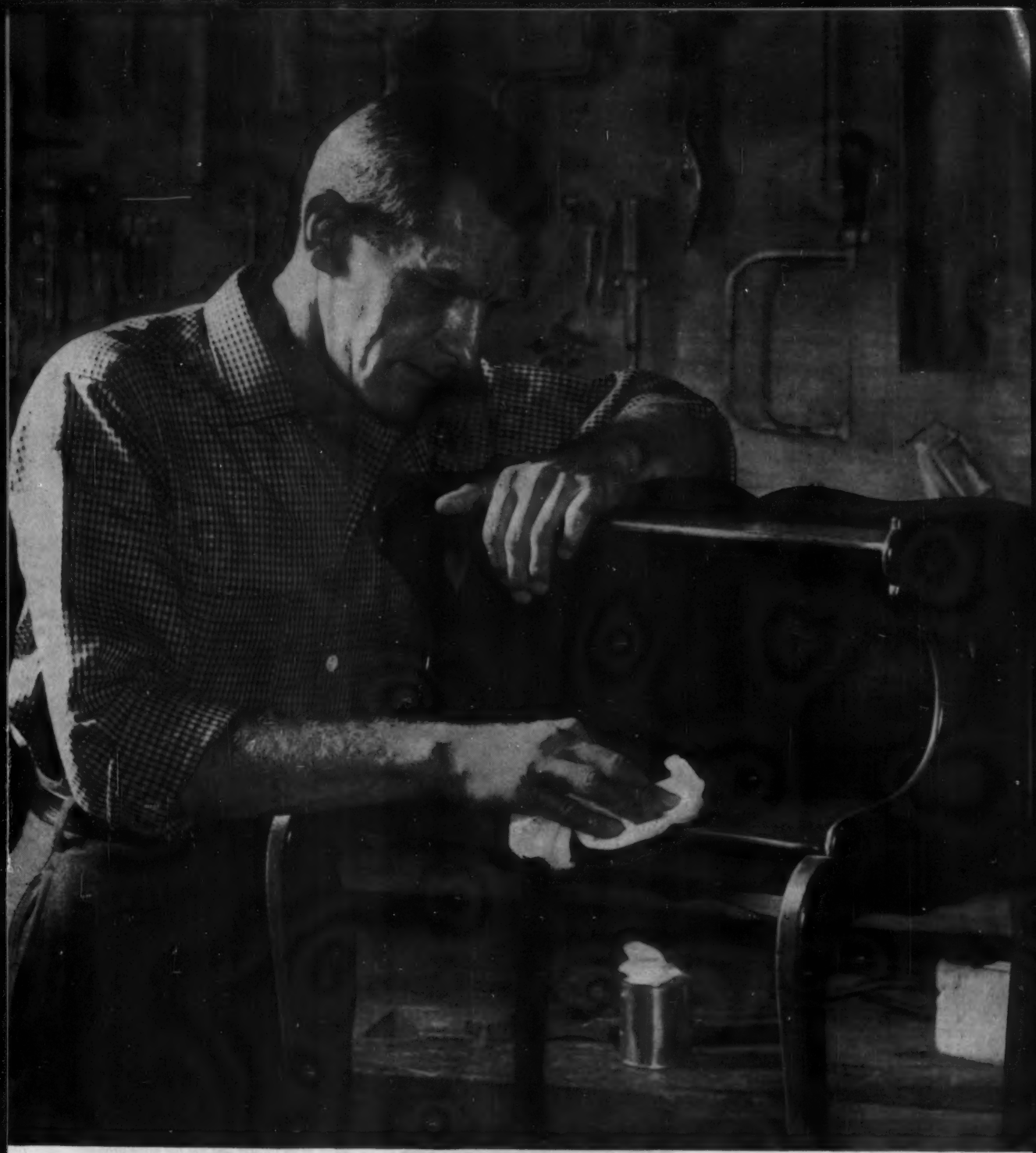
Stringing Blocks . . .

. . . take all types of conductor. Throat is large with clearance for swivels and splices. Wide frame eliminates springing and binding sheave. Parabolic sheave groove may be used with regular or expanded ACSR or aerial cable. Steel frames, pressure-cast aluminum alloy sheaves, and self-lubricating bronze or shielded ball bearings are standard. Bonded neoprene liners are available on special order. Sizes range from 5 to 18 in.
Campbell Specialty Co, Okmulgee, Okla.

Automatic Programmer . . .

. . . for electrostatic precipitators has no moving parts, can be applied to new or existing installations. It is equipped with spark-frequency,

(*Continued on page* 82)



TIME IS THE MEASURE OF ALL WOOD PRESERVATION

On the job–as on your own time–you know the importance of wood preservation.... The more the statistics accumulate, the more clearly the answer is AMCRECO pressure treatment.

AMCRECO
PRESSURE TREATED WOOD PRODUCTS

AMERICAN CREOSOTING CORPORATION LOUISVILLE 2, KENTUCKY
SUBSIDIARY OF UNION BAG-CAMP PAPER CORPORATION

CFC PURIVAC

A complete system for purifying insulating oil

The CFC Purivac is a *complete system* for purifying, dehydrating and degasifying insulating oil. It operates either at a central reclaiming station or in the field while electrical equipment is in service. With Purivac, you extend the useful life of oil indefinitely.

Purivac prevents formation of sludge deposits that cause overheating and burn-outs along sludged surfaces; eliminates costly system cleanouts; reduces corrosion and deterioration of fabric insulation; cuts electric losses by keeping power-factor percentages and operating temperatures low; restores interfacial tension and dielectric strength.

A Commercial Filters engineer will be glad to demonstrate the advantages of Purivac. Write for technical literature to Department EW.

COMMERCIAL FILTERS
CORPORATION
MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

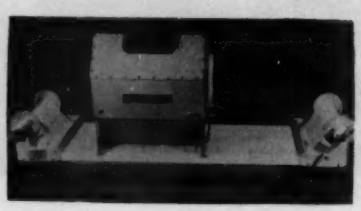
Automatic Programmer

(*Continued from page* 80)

incremental-voltage, and maximum current-limiting adjustments. Use of potted transistors, rectifiers and other static components reduces maintenance, and contributes to long operating life.
General Electric Co, Schenectady 5, N. Y.

Service Entrance Caps . . .

. . . take rigid conduit, EMT, as well as service entrance cable. First size in the line will accommodate 3 No. 1/0 service entrance cable and 1½-in. rigid or thin-wall conduit. Extended visor protects raceway against rain and snow. Anchor plate simplifies attachment to building. Made of cast iron and hot-dip galvanized, the caps will be available in sizes from ½ to 2 in.
The Thomas & Betts Co, Elizabeth, N. J.



Optical Comparator . . .

. . . for graphical data can also be adapted for three-dimensional objects. It determines qualitative and quantitative differences. When two objects are inserted into model 167

(*Continued on page* 84)

For "small-job sealing"...

Johns-Manville

Duxseal

in the new handy pocket roll

THE NEW HANDY pocket roll makes Duxseal® ideal for small sealing jobs in both installation and maintenance work. It thereby increases the usefulness of your favorite all-purpose sealing and caulking compound.

The NEW pocket roll container allows quick removal and replacement of the compound. Its ribbon form makes Duxseal easy to apply in any amount, large or small.

3 types of Duxseal are now available in pocket rolls:

- **STANDARD DUXSEAL** is a permanently plastic gray-green compound utilizing a non-drying, vegetable-oil vehicle. It will not corrode metals, plastics, wood, rubber, or painted surfaces. It adheres well to all common materials. It is non-staining.
- **TYPE N DUXSEAL** has the same properties plus higher resistance to bleeding or dripping at high temperatures.
- **R-100 DUXSEAL** employs a resinous material as its vehicle and has the same properties. It skins fast to provide an excellent paint surface.

A wide range of other J-M Sealing Compounds is also available in pocket rolls. These are described in sheet EL-85A. Duxseal is covered in sheet EL-68A. Write Johns-Manville, Box **14**, New York 16, N. Y.

Johns-Manville

DUXSEAL

Another Porcelain Products "Plus Service"

G. M. Ruoff, right, President of Porcelain Products, Inc., congratulates George Dove of the Baltimore & Ohio Railroad Company upon the linking of Parkersburg with nationwide "Piggy-Back" service.

NOW..."Piggy-Back" Truck Shipments To Your Door

STORE-DOOR RAIL FREIGHT DELIVERY — Another Porcelain Products "Plus Service" — Another valuable time saver added to our 21 regional warehouse stocks. All a part of our plan to give you WHAT YOU WANT, WHEN YOU WANT IT.

NOW . . . Transmission-Distribution Insulators via "Piggy-Back".

The trailers shown above were loaded in Parkersburg, W. Va. at 10:30 A.M. and backed into customer's docks in St. Louis, Mo. at 1:30 the next afternoon.

ORDER NOW! . . . take full advantage of Porcelain Products' many "Plus Services".

Porcelain Products, Inc.
High Voltage Division — Parkersburg, W. Va.

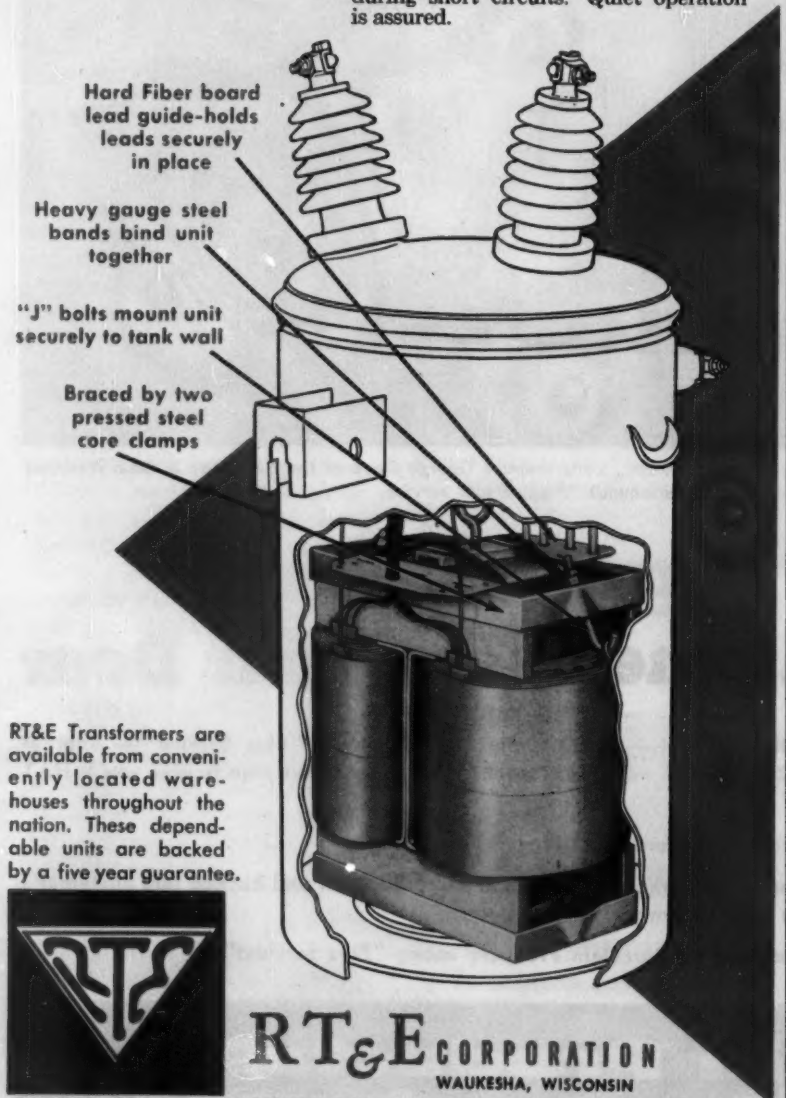
What Makes RT&E Transformers Better?

RUGGED CORE-COIL CONSTRUCTION

Insures longer, more reliable transformer life.

Maximum mechanical strength of Core-Coil unit is obtained by RT&E's unique core-coil clamping method. This eliminates the conventional vertical clamp members by utilizing the tank for this purpose.

A rigid, unitized construction is thereby attained. This maintains all parts firmly fixed with relation to each other—additional coil surface is exposed to the cooling oil, and additional strength is gained for bracing the coil against distortion during short circuits. Quiet operation is assured.


Hard Fiber board lead guide-holds leads securely in place
Heavy gauge steel bands bind unit together
"J" bolts mount unit securely to tank wall
Braced by two pressed steel core clamps

RT&E Transformers are available from conveniently located warehouses throughout the nation. These dependable units are backed by a five year guarantee.

RT&E CORPORATION
WAUKESHA, WISCONSIN

RUGGED CORE-COIL CONSTRUCTION — *Another reason why* RT&E *is better!*

Optical Comparator

(*Continued from page* 82)

comparator their images, one pink and one green, can be viewed by operator. When objects are identical, the image obtained when pink and green images are superimposed will be black. If not, they retain their original color.

Perkin-Elmer Corp, Norwalk, Conn.

Service Entrance Sleeves . . .

. . . of compression type join any combination of ACSR, aluminum, or copper. Metal wall divides sleeve into two chambers so that conductors of unlike metals cannot touch. Conductor sizes (from No. 6 to 1/0 aluminum or copper) are printed on color-coded tapes in large numbers. Sleeves are filled with z.l.n. 100 contact aid. End caps are plastic. Made in ½-and ⅝-in. sizes, the sleeves can be compressed with standard tools.

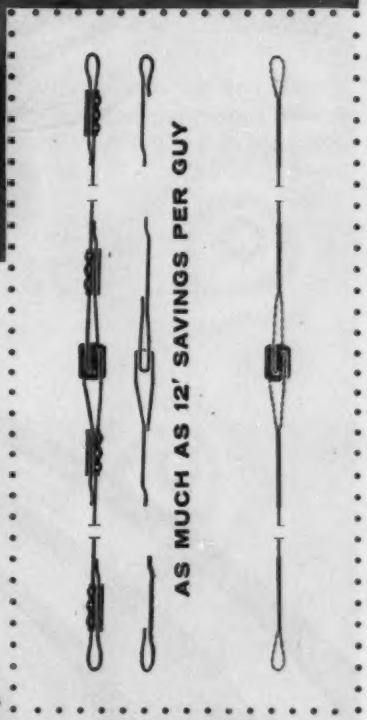
A. B. Chance Co, Centralia, Mo.

Temperature Indicator . . .

. . . detects acceleration of temperature rise, thereby anticipating bearing failure in steam turbines, generators, and other rotating machinery under test. This allows tested device to be shut down and its bearings examined at beginning of failure, before destruction takes place. Instrument includes a thermocouple input balancing network, thyratron control circuit, and power supply among its components.

Range is from 600F to —150F with accuracy of ±10F. Measuring 8¼x8¼x13⅛ in. overall, the unit weighs 23 lb.

Lycoming Div, Avco Mfg Corp, Stratford, Conn.



Up to 30% savings in strand... with PLP Guy-Grip Dead-Ends

You will find real guying economy with PLP Guy-Grip dead-ends. Because they eliminate strand looping, you can use *shorter, straight* lengths of guy strand. This means as much as 12 feet savings in strand per guy. What's more, the finished installation is neat, streamlined, efficient.

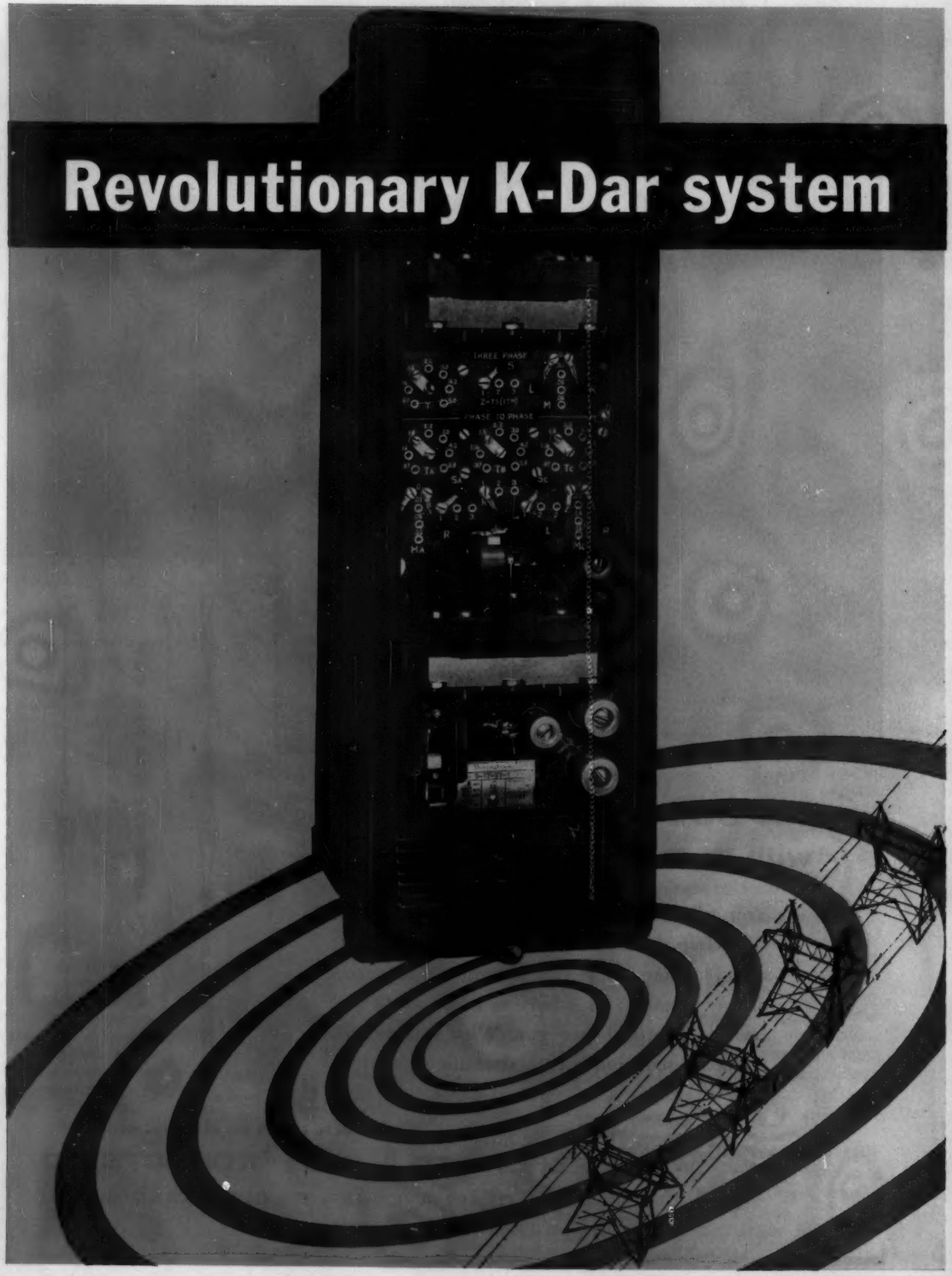
FX-80

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents issued and pending.

PREFORMED LINE PRODUCTS CO.

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO
DEPT. NO. PR1B
Telephone: Cleveland EXpress 1-3571

Revolutionary K-Dar system



. . . a NEW relaying principle

Transmission line phase fault protection using compensator distance relays

Relays making up the new K-Dar system provide high-speed protection of transmission lines from three-phase and phase-to-phase faults. K-Dar provides high-speed coverage of 90% of the line section with adjustable time-delay back-up of adjacent line sections . . . or provides simultaneous tripping of circuit breakers on a faulted section as a part of a carrier or micro-wave scheme.

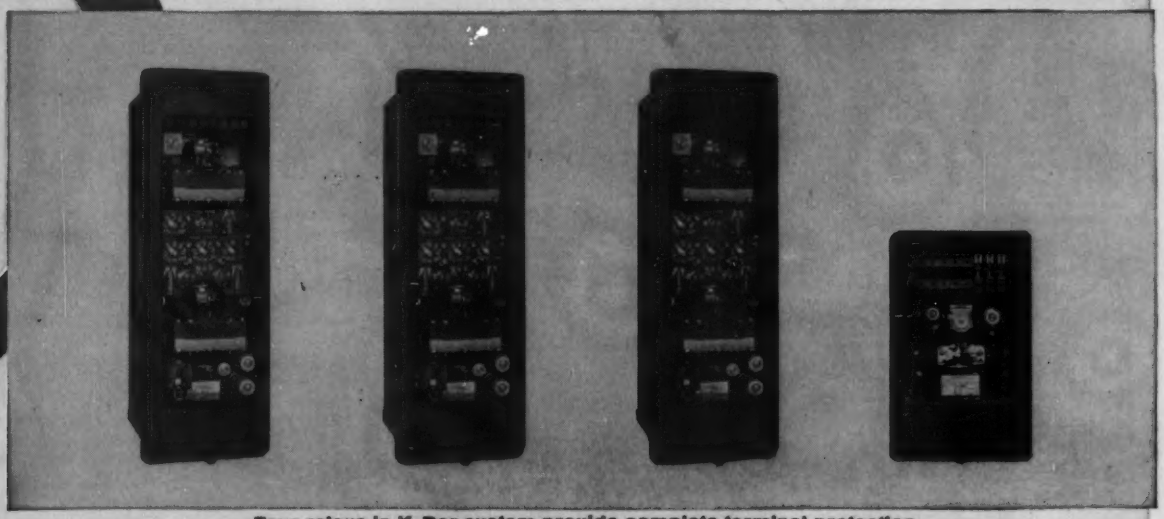
K-Dar is insensitive to transients . . . provides more accurate response to relay settings. Air gap compensators provide effective transient shunt. More reliable response permits relay setting to achieve greater line coverage.

K-Dar phase-to-phase relay unit operates independent of load current . . . Phase-to-phase settings can be made to reach further out on a line section because relay unit operates independent of load current or system-swing conditions.

K-Dar features simplified design . . . Low maintenance with K-Dar . . . few moving parts. With few adjustments, relay setting is much easier . . . testing is reduced to a minimum.

For complete information about the new K-Dar system, call your Westinghouse salesman. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-40500

YOU CAN BE SURE...IF IT'S Westinghouse



Four relays in K-Dar system provide complete terminal protection

For
"ORIGINAL EQUIPMENT"
Performance

ALLIS-CHALMERS
CORE and COIL
Replacement
Assemblies

THESE replacement units feature the same craftsmanship, high grade materials and quality control that have made Allis-Chalmers transformers preferred equipment. Assemblies are thoroughly dried in controlled ovens, tested, and sealed in a metal container filled with high grade transformer oil.

Compact design permits up-rating of old units. Adjustable anchoring arrangement assures accurate fit. Provisions for mounting low voltage breaker and winding for signal light are standard.

Get all the facts on these new light weight — easy to install units. See your A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

A-5499

ALLIS-CHALMERS

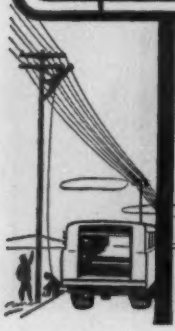
INDIANA STEEL & WIRE CO. Crapo Galvanizing MUNCIE IND.

Signs along the lines of *Crapo* GALVANIZED STEEL STRAND PERFORMANCE

For dependable performance . . . insist upon *Crapo* Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes *Crapo* Steel Strand first choice for guys, messenger and overhead ground wire.

The famous *Crapo* galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.

- Low maintenance cost
- Laboratory tested and controlled quality
- Meets highest quality standards
- A size and grade for all practical needs
- Contact your *Crapo* Jobber Today!



INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

The Odds Are 4 to 1

When busy engineers and executives in the dynamic electric power industry get around to naming the one magazine they find most useful in their work, it's ELECTRICAL WORLD, by a margin of 4 to 1. Year after year, survey after survey, WORLD earns *at least* four times as many votes as any other magazine in the field.

COATES Field Service, INC.

P. O. Box 1581 Okla. City

Thoroughly Specialized

RIGHT-OF-WAY ACQUISITION

From Title Search . . . To Damage Claims

CATALOGS–BULLETINS

• **PLASTIC PROTECTORS:** S. S. White Plastics Div discusses over 200 plastic protective plugs and caps in its 18-page, two-color bulletin P 5708. Write the manufacturer at 10 East 40th St, New York 16, N. Y.

• **MULTIPLE NUT SETTING:** A 24-page manual on Thor automatic multiple nut setters has been issued by Thor Power Tool Co, Aurora, Ill.

• **INFRA-RED RESEARCH:** "Answer-Power" is the title of a brochure covering research & development in the infra-red field by Servo Corp of America, 2020 Jericho Tpk, New Hyde Park, N. Y.

• **COAL HANDLING:** Illustrated 20-page bulletin from International Harvester Co, 180 N. Michigan Ave, Chicago 1, Ill., is entitled "The Money-Saving Way to Stock-out, Reclaim, and Compact Coal."

• **ANODES & PLATING CHEMICALS:** A 12-page bulletin describes and illustrates full line of anodes, anode accessories, and chemicals for electroplating and metal finishing. Write for Bulletin AC-110 to Hanson-Van Winkle-Munning Co, Matawan, N. J.

• **ELECTRIC HEATER PANELS:** Control of electric ovens and furnaces with A-C Electric Heater Panels is discussed in ASCO catalog 57-S3. Write Automatic Switch Co, Florham Park, N. J.

• **MISCELLANEOUS:** The following publications listed below were recently published by General Electric Co. The address is Schenectady 5, N. Y. unless otherwise mentioned:

Floodlights—How to select and apply them are discussed in bulletin GEA-6175A.

Capacitor applications and uses with diagrams and pictures are the subject of bulletin GEA-5632B.

Motor starters—Magnetic line of size 0 and 1 with comprehensive data on the starters can be found in bulletin GEA-6611.

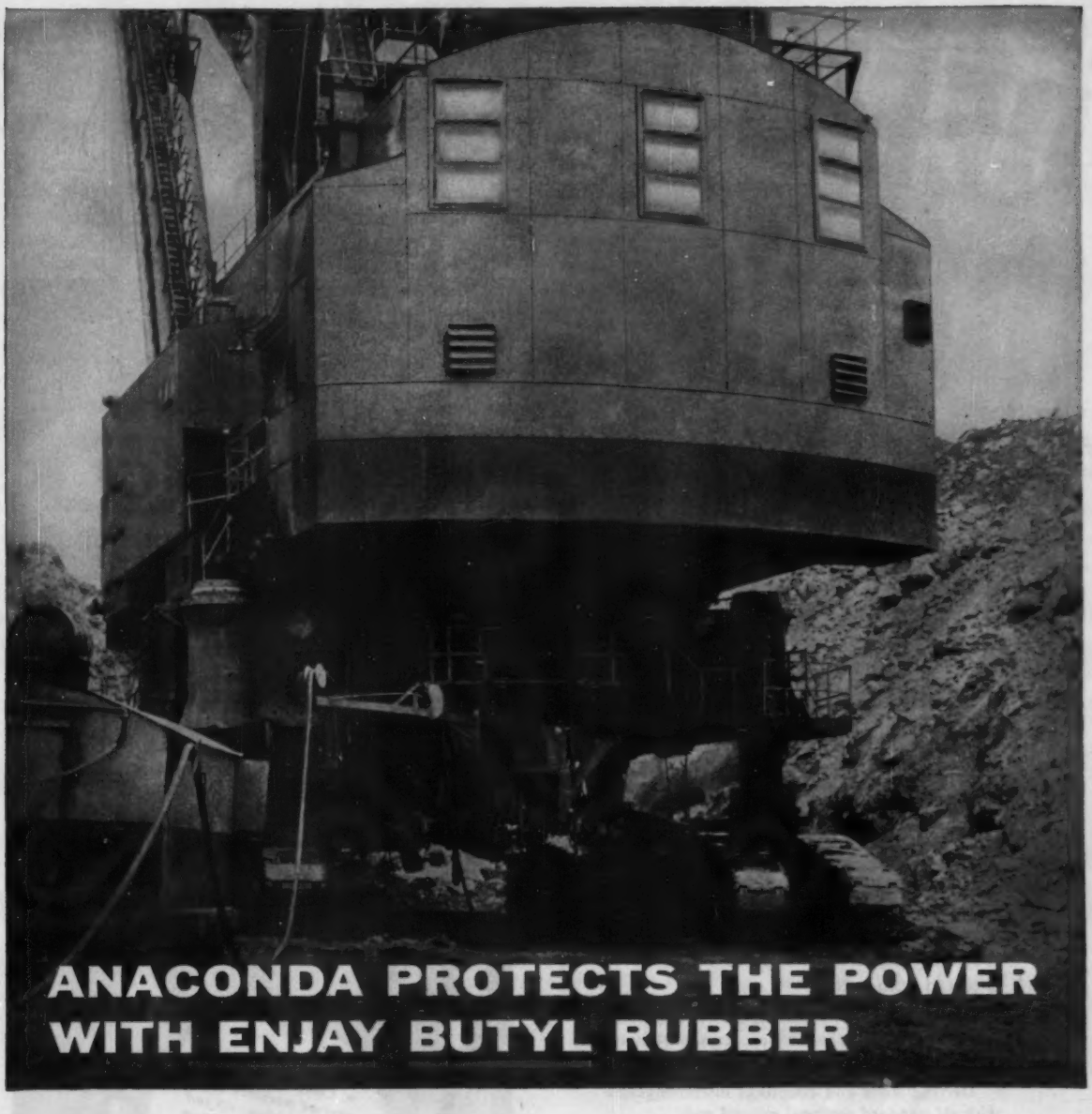
Numerical positioning control is described for automatic point to point positioning of machines and machine tools in bulletin GEA-6594.

"Transistor Manual"—second edition containing basic information on transistors and their use in electric circuits has been issued by Semiconductor Products Department, Syracuse, N. Y.

Bulletin GEA-6750 contains descriptions of the industrial line of molded case circuit breakers from 15 to 80 amp. Write General Protective Devices Department, Plainville, Conn.

Leak detection by means of mass spectrometry is explained diagramatically in bulletin GEA-336B.

Ballasts—A 16-page booklet, GEC-983K, covers the company's line of fluorescent ballasts.



ANACONDA PROTECTS THE POWER WITH ENJAY BUTYL RUBBER

Talk about impact resistance! The 5-year-old Anaconda cable supplying this giant shovel with power was buried under thousands of tons of rock when a whole wall of the open pit mine caved in . . . *yet the cable continued to supply power!* This is one of the many Anaconda products featuring Enjay Butyl for *outstanding* performance.

Enjay Butyl is *unmatched* in its resistance to impact and abrasion, moisture and weathering, ozone and corona . . . properties that make it the world's outstanding rubber value.

Low in cost and immediately available in a grade tailor-made for *your* electrical application, Enjay Butyl is *the* rubber to boost performance and cut costs. For further information, and for expert technical assistance, contact the Enjay Company.

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.

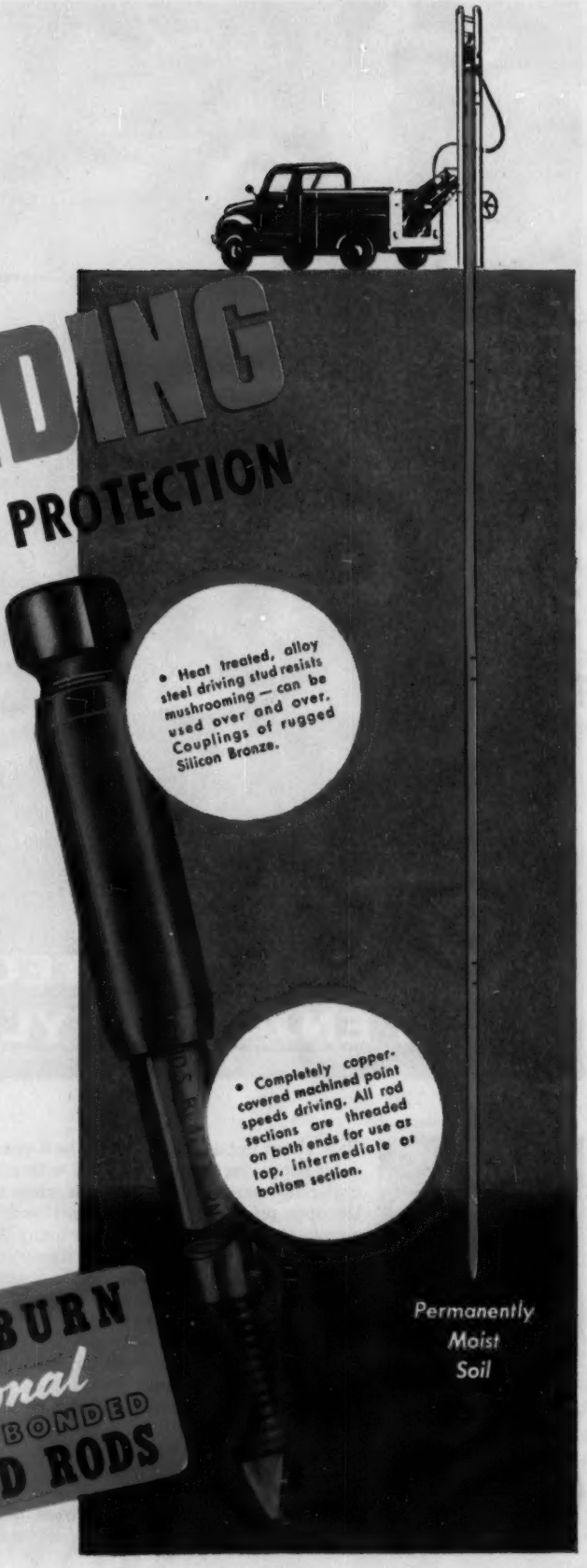
Akron • Boston • Chicago • Detroit • Los Angeles • New Orleans • Tulsa

ENJAY BUTYL

Enjay Butyl is the world's greatest rubber value . . . the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

DEEP DEEP GROUNDING

INSURES EXTRA PROTECTION


• Heat treated, alloy steel driving stud resists mushrooming — can be used over and over. Couplings of rugged Silicon Bronze.
• Completely copper-covered machined point speeds driving. All rod sections are threaded on both ends for use as top, intermediate or bottom section.
Permanently Moist Soil

Blackburn Sectional Rods Get Down Into The Permanently Moist Soil

Drive down to permanently moist soil that gives lower earth to rod resistance. Actual experience shows a few dollars invested in deep grounding has saved thousands of dollars in overhead burn-outs.

- **BLACKBURN Sectional Rods have a uniform coating of highly conductive corrosion-resistant copper, molecularly bonded to *rigid steel core.***
- **Driving studs and couplings interchangeable with all standard sectional ground rods.**
- **Available through Electrical Distributors.**

JASPER BLACKBURN CORPORATION
1525 Woodson Rd., St. Louis 14, Mo.
WYdown 3-9430

BLACKBURN *Sectional* COPPER BONDED GROUND RODS

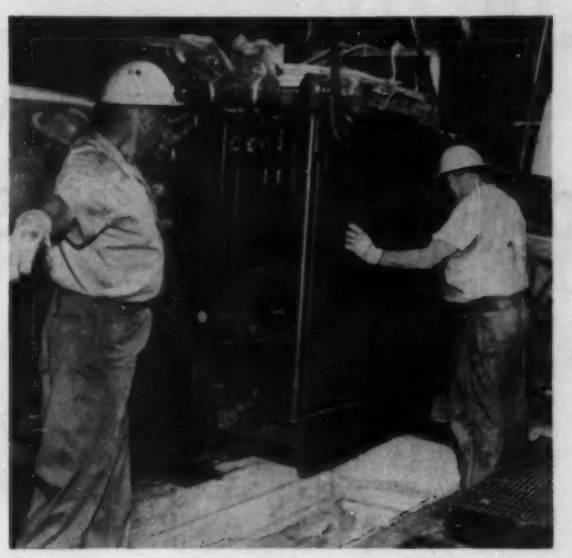
Distributed on the West coast by KORTICK MFG. CO.

Vapor-Cooled Transformer Placed in Service

A 500-kva, vapor-cooled, gas-insulated submersible transformer is operating on the network system of Consolidated Edison Co of N. Y. Inc. Having gone in service on July 19, it is reported to be the first and only unit in commercial operation utilizing high dielectric strength gas.

Vapor cooling of transformers was announced by Westinghouse in the autumn of 1951. This network transformer utilizes a combination of a fluorochemical and sulfur-hexafluoride as the cooling and insulating medium. These compounds are reported to be nonflammable and to have fire extinguishing properties.

In vaporization cooling, a small pump forces liquid from a sump in the tank to an elevated nozzle where the liquid is applied uniformly over the core and coils. The liquid evaporates taking its latent heat of vaporization from the coils. The vapor fills the space in the tank and part of the cooling tubes. As the vapor migrates upward through the tubes, it condenses releasing the latent heat of vaporization. The condensate flows by gravity back to the sump.



ASA Reports Progress on 11 Standards

American Standards Association, New York, reports the status of the following American Standards.

Published—Safety Standards for Grounding and Bonding Equipment, ASA-C33.8-1957.

Approved — Specifications for Polyethylene Type Weather-Resistant Wire and Cable, C8.35-1957. Spotlight and Floodlight Service Incandescent Lamps for 115, 120, and 125 volts, C78.105-1957. Method for the Designation of Mercury Lamps, C78.380-1957. Glossary of Terms in Nuclear Science and Technology, N1.1-1957; price $5.

In Board of Review—Wet-Process Porcelain Insulators, Apparatus-Cap and Pin Type, C29.8. Wet-Process Porcelain Insulators, Apparatus-Post Type, C29.9. Requirements, Terminology, and Test Code for Distribution, Power and Regulating Transformers, and Reactors Other Than Current-Limiting Reactors, C57.12d (a partial revision of C57.12).

In Standards Board—Schedules of Preferred Ratings for Power Circuit Breakers, C37.6. Power Circuit Breaker Control, C37.11. Definitions of Electrical Terms, Group 95, Miscellaneous, C42.95.

Simplex Cable Supplied in Hawaiian Phone Service

The world's longest undersea telephone cable system opened October 8. It runs between Point Arena, Cal., 105 mi north of San Francisco, and Hanauma Bay, Oahu, 12 mi east of Honolulu.

The $37-million system was built (EW, August 19, 1957, p 138) jointly by American Telephone & Telegraph Co and the Hawaiian Telephone Co. Simplex Wire & Cable Co, of Cambridge, Mass., supplied about 60% of the cable and armoring for the project.

Operator dialing, new to overseas telephony, is a feature of the 2,400-mi link.

Hathaway Develops Automatic Oscillograph

Hathaway Instrument Div of the Hamilton Watch Co has developed an automatic oscillograph for the utility industry. The RS-9 Thirty compresses 32 channels into a case that projects only 8 in. from switchboard panel. It includes six operating relays and a 12-in. chart.

Blackburn Clamps Get "See-Thru" Plastic Coat

Jasper Blackburn Corp is now coating its pre-filled clamps with a transparent plastic instead of cellulose acetate.

The new plastic coating is molded to the clamp by the Auto-Vac application process.

This is said to permit quick recognition of the style of clamp (i. e. aluminum to aluminum, copper to copper). Identification tag has been discarded, since catalog number and

(*Continued on page* 94)

IF IT CARRIES CURRENT, KW CARRIES IT!

NEW LAYTEX-RESIN INSULATION GIVES KW CONTROL CABLES FINEST PROTECTION MADE!

Greatest Insulation Advance in 25 Years!

Now with new "Kaiser Master" Control Cables, KW brings you *Laytex®-Resin* . . . the greatest advance in insulation since the introduction of pure-rubber Laytex insulation in 1932.

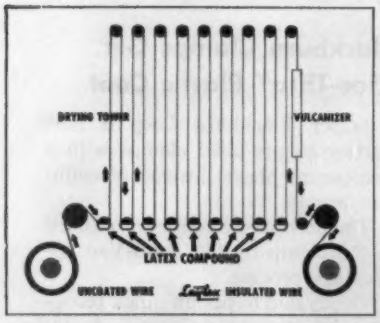
In Laytex-Resin, the synthetic resin conductor covering becomes an integral part of the insulation. The resin is applied in the same dip process as the Laytex, and is fused right into the rubber. This eliminates the need for protective braid covers, which in turn permits greatly reduced cable diameters!

In addition to smaller diameter and resulting lighter weight, Laytex-Resin cables offer all these other advantages over cables with braided conductors:

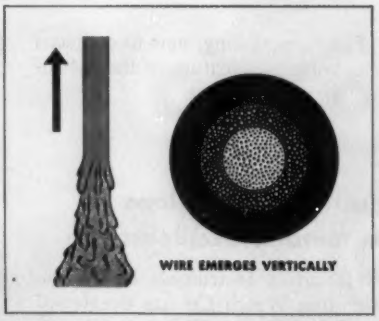
1. **More complete (100 per cent coverage) protection of the insulation.**
2. **Greater protection of the insulation against acids, alkalies, flame, fungus, moisture, oil, ozone and light checking.**
3. **Cover does not fray or wick moisture.**
4. **Splicing and taping made easier.**
5. **Smoother conductor surface.**
6. **More attractive colors (including stripes).**

For a record of dependability in municipalities all over America, KW Laytex-Resin Control Cables are backed up by twenty-five years of perfect service given by their predecessors, Laytex insulated control cables.

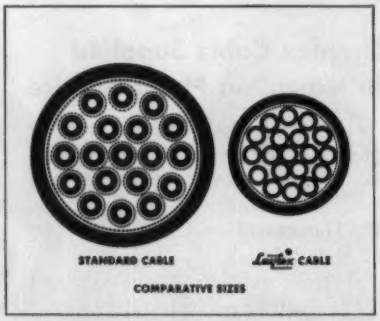
KW "Kaiser Master" Control Cables more than meet the standards set up by I.M.S.A. Specifications No. 16. These cables have tinned or alloy-coated solid copper conductors in accordance with A.S.T.M. requirements. The choice of an overall protective covering for these cables is determined by the customer and is governed by conditions of installation and use.



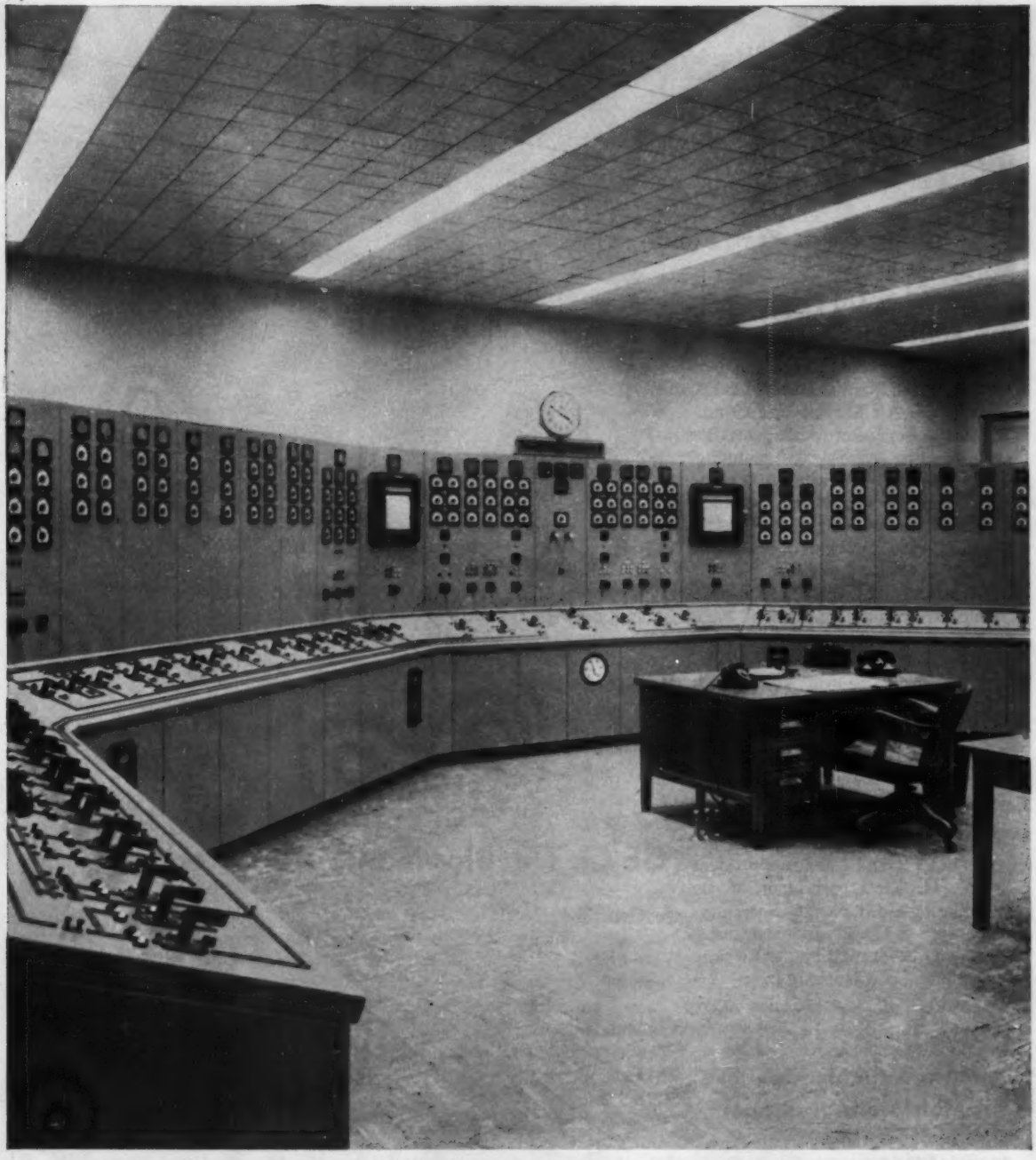
Laytex-Resin is applied to each individual conductor by the dip process diagrammed above. Because the rubber is applied in unmilled form and the resin is bonded directly to it, Laytex-Resin insulation has no "grain"—its physical properties are *uniform in all directions.*



In the dip process, the conductor emerges vertically from the liquid compound, forming the compound in uniform layers around the conductor. This results in a perfectly centered conductor and permits an insulation with thinner walls than are possible with extruded rubber.



Because the wall thickness required with Laytex-Resin is only one-third to one-half that required for conventional insulations, and because braided conductor covers are eliminated entirely, Laytex-Resin makes possible *more wires per conduit* . . . plus reduced weight and increased flexibility.



The properties and the performance demonstrated by KW Laytex and Laytex-Resin Control Cables all add up to unequaled *Dependability*. These cables may be installed (1) in conduits, ducts or trays, (2) as aerial cable on a suitable messenger, or (3) buried in the ground.

For immediate service, or for further information and samples, call the Kaiser Aluminum sales office or the KW distributor listed in your telephone directory. Kaiser Aluminum & Chemical Sales, Inc., *Executive Office,* Kaiser Bldg., Oakland 12, Calif.; *General Sales Office,* Palmolive Bldg., Chicago 11, Ill.

KAISER Aluminum

Blackburn Clamps

(*Continued from page* 91)

wire range are plainly visible on clamp.

The manufacturer reports the new plastic coating is easy to remove even with cumbersome lineman's gloves.

AMCA Sets Up Program on Fan Tests, Performance

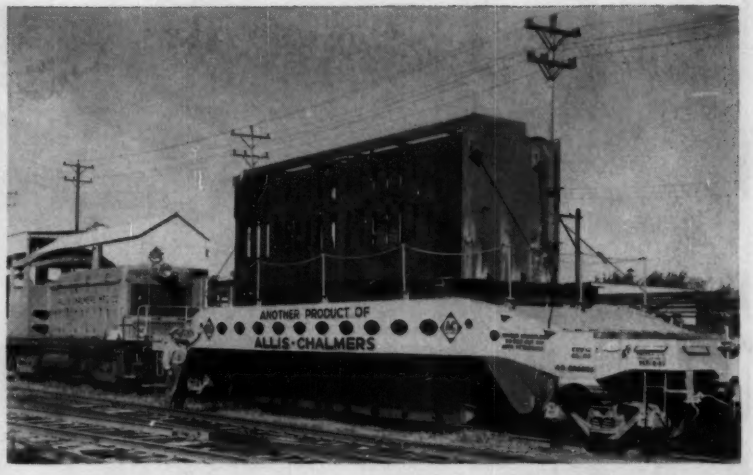
Air moving equipment will perform as the manufacturer claims, reveals the Air Moving and Conditioning Association (AMCA). After almost two years of planning, AMCA has a program to provide a means of identifying products properly tested and their performance accurately rated according to a uniform procedure of the AMCA Standard Test Code. Equipments covered are centrifugal, axial and propeller fans, and power roof ventilators. Other equipment activities cover central station air conditioning units and unit heaters.

AMCA has headquarters at 2159 Guardian Building, Detroit 26, Mich. Founded January, 1956, this non-profit trade association has a membership of 58 manufacturers of air moving and conditioning devices in U. S. and Canada. President is W. H. Rietz, president of Ilg Ventilating Co, Chicago. Secretary-Treasurer is J. P. Johnson, sales manager, Ventilating Division, Swarthout Co, Cleveland.

Aminco Markets Monitor for Moisture in Hydrogen

A dew-point monitoring system to record the amount of humidity in hydrogen coolant for generators is ready for marketing by American Instrument Co, Silver Spring, Md. An alarm is sounded if the hydrogen contains excessive moisture.

In this system sensing stations continuously sample the moisture content of the hydrogen. The dew-point temperature is detected by the sensing stations and transmitted to a recorder. An excess of humidity through the drier will cause a relay to actuate an alarm.



King-Size Condenser Goes to AEP Co

Destination of this section of a 130,000 sq ft single-shell condenser is the new Clinch River Plant of Appalachian Electric Power Co. The condenser is the largest of its type shipped to date by Allis-Chalmers Mfg Co.

Separated into four parts to meet shipping clearances, this condenser section is shown aboard a specially designed and built "well" center railroad car (EW, April 22, 1957, p 104). Shipment of the condenser was made to coincide with completion of the enlargement of a Norfolk & Western Railway tunnel in Virginia enroute to the plant.

Installation of the condenser will be somewhat unusual because the condenser will be substantially on the same elevation as the axial-exhaust turbine.

GE Co Developments Reported

General Electric Co has reported on the following developments:

• Four 3,750-kva sealed dry-type transformers weighing over 18 tons each have been purchased by the Inland Steel Co. They will supply in-plant power for Inland Steel's Indiana Harbor, Ind., works.

• The nation's first automatically-programmed resistance welding machine is welding tabs on cylindrical liners for jet engines at GE's Small Aircraft Engine Dept, Everett, Mass. A joint effort by GE and National Electric Welding Machine Co, the machine has cut welding time on the liners from 9½ down to 1½ hr each.

• A price increase of 1¢ per lb on phenolic molding powders, industrial resins, and laminating varnishes will be effective with shipments on or after November 1.

• Switchgear has been ordered for the 812.5 Mw (net capability) steam generating station being constructed for Memphis Light, Gas, & Water Div. GE's High Voltage Switchgear Dept will supply 14 steel-clad impulse oil circuit breakers, each with interrupting capacity of 15 kva and rating of 161 kv. Medium Voltage Switchgear Dept will supply 4,160-v metal-clad station service switchgear, and Low Voltage Switchgear Dept will supply 18 480-v unit substations.

• Two 7.5-Mw gas turbines have been ordered by Industria Colombia de Fertilizants, S. A., of Colombia.

• Trailer-mounted substation with a capacity of 9,000 kva, wes delivered recently to Puget Sound Power & Light Co, Wash. Conforming to all highway and dimension limits in the company's service area, the mobile substation can step down power from 65,080 v to 13,090 v or 4,360 v. Total weight without trailer is 27 tons.

world's smallest, lightest indoor/outdoor unit: only nine pounds . . . completely weather resistant

Designed for indoor/outdoor use, the new Westinghouse Type EMP potential transformer resists the effects of weather, as well as the industrial hazards of acids and alkali fumes. This makes it the ideal companion to use with the molded Types EMO and EMR current transformers.

The Type EMP has a thermal capacity of 150 VA and an accuracy of 0.3 at W burden. It will operate with 0.3 accuracy on practically all single meter installations and will handle multimeter installations with the same accuracy, providing the overall burden does not exceed 12.5 VA at 10% P.F.

The Type EMP is the FIRST completely molded potential transformer. Its unique construction results in such outstanding performance features as:

Longer life — Utilizing a polyester elastomer insulating material — a product of Westinghouse research — combined with corrosion-resistant metalware (baseplate and terminal studs) makes the EMP ideal for indoor/outdoor use. This resilient plastic covering is virtually shatter and chip-proof.

Lighter, Smaller. Polyester molding results in a smaller unit, with a total weight of only nine pounds.

Unequaled dielectric stability. The polyester insulating material will not break down even under severe dielectric stresses. The EMP has an impulse test level of 10-kv.

The new Type EMP potential transformer is available in 240-120, 480-120 and 600-120 volt ratings. For further information, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70824

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Your Circuits Need the of KEARNEY

close coordination through precision-matched time-current characteristics

KEARNEY TYPE KS
Specialized to protect equipment, minimize outages on circuits subject to switching and lightning surges. Provides extra high surge protection without sacrificing overload capacity.

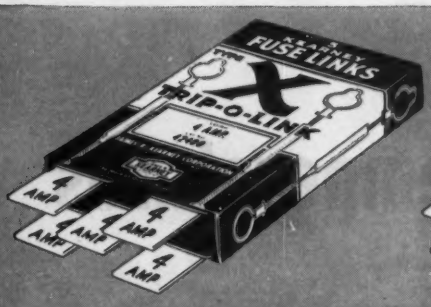
Easy Handling! Patented KEARNEY Pul-Tab Fuse Pak makes it easy for linemen to pull out the right fuse. All Fuse-Paks are color-coded, with clear markings, for quick stockroom selection.

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

JAMES R. KEARNEY
The Mark of Quality

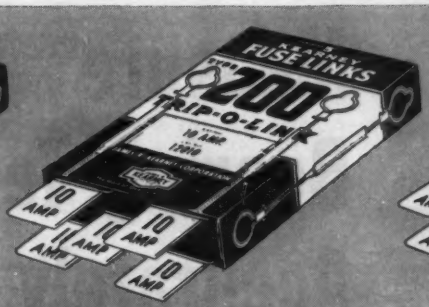
Field-Proved Protection

Specialized FUSE LINKS



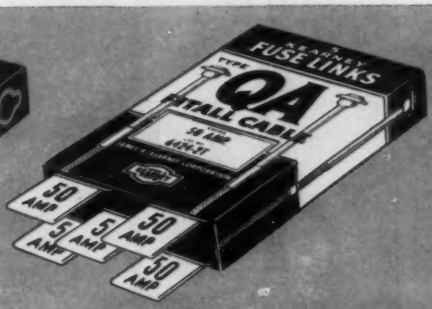
KEARNEY TYPE X

Specialized to maintain transformer service during heavy overloads and surges, yet clear the fault before damage range is reached. Opens 230% of rated current within five minutes.



KEARNEY TYPE 200

Specialized to protect troublesome circuits subject to overloads and surges of long duration. Carries overloads up to 150% indefinitely without damage to fuse link or cutout.



KEARNEY TYPE QA

Specialized to open at lower percentage of rated current, and consequently to melt more rapidly than fuse links of same amp. rating which are designed to open 230% of rated load within five minutes.

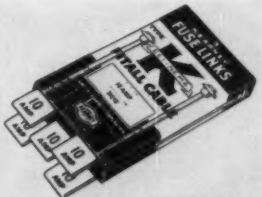
Get the accurate performance you expect—and pay for—with KEARNEY specialized Fuse Links. They're design-matched to today's safe loading curves... specialized so you can select the time-current characteristics to match your needs precisely. They're *field-proved* at KEARNEY's own substation laboratory, and on power lines throughout America.

For the *close coordination* that protects your equipment against overloads... protects your revenue against needless load dropping... specify KEARNEY. Contact your KEARNEY Representative for fusing recommendations based on your specific requirements.

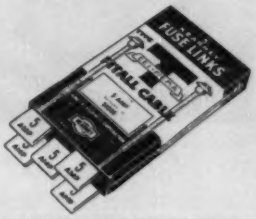
370

KEARNEY
Standard
FUSE LINKS

Give you the same field-proved accuracy and dependability.



FAST—TYPE K: EEI-NEMA standard fast fuse link



SLOW—TYPE T: EEI-NEMA standard slow fuse link

JAMES R. KEARNEY CORPORATION

General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

Plants at: ST. LOUIS • FAYETTEVILLE, ARK.
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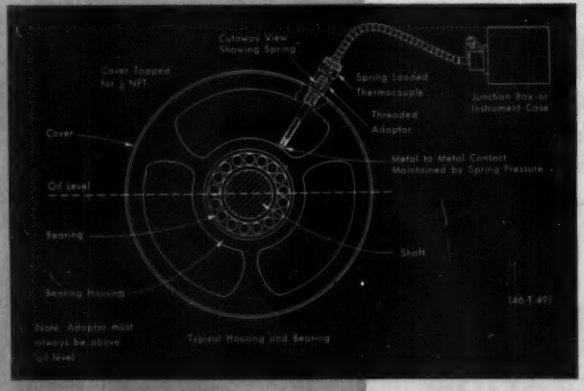
Available in either straight or 90° angle construction for ease of installation.

Measure Bearing Temperatures Accurately...

with NEW Honeywell *spring-loaded thermocouple*



This new Honeywell thermocouple maintains continuous contact with the race surface, even though the surface may expand, contract or become displaced during operation. It assures accurate temperature measurement of bearings and turbine cases.

The tip of the thermocouple is held securely against the race surface by an *Inconel-X** spring. This spring maintains firm, metal-to-metal contact even if the hole into which the thermocouple is inserted varies as much as ±5/16″ from specified depth.

Inspection and replacement are easy. The thermocouple assembly is provided with a bayonet adapter to fit a 1/8″ NPT pipe connection. A matching cap on the assembly itself engages the adapter: just push in, twist, and it's connected.

Call your nearby Honeywell field engineer for complete details. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

*Tradename of International Nickel Co.

Honeywell

First in Controls

ELECTRICAL BUSINESS OUTLOOK

Electrical World
OCTOBER 21, 1957

Demand for new homes is going up faster than homes are being built. Despite a dropping percentage of vacant dwellings and rising wage scales of potential buyers, the number of homes built last month was not impressive.

The figure was 8% below September 1956, which wasn't a boom-month itself.

"There is absolutely no sign on the horizon of an upturn in homebuilding later in the year," was the comment of a National Housing Conference official.

And 1958 homebuilding will rise less than 1% over this year's disappointing totals, according to the magazine "Architectural Forum."

The drop in government-backed mortgages is behind the gloom. Tight money has stifled the last gasp of the GI loan program, and slowed FHA loans.

When Congress raised the FHA rate from 5 to 5¼% in an effort to attract more money lenders to home loans, they also slapped a ceiling on discounts.

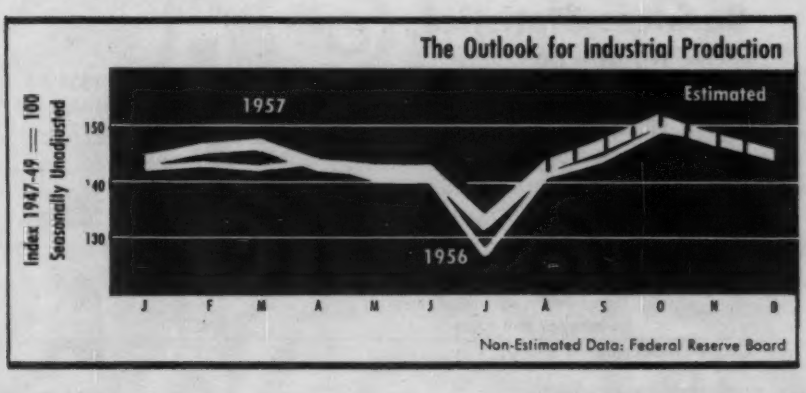
A discount is a percentage of money borrowed that the borrower never gets. For example, a home-buyer who takes out a $10,000 mortgage at 5% discount borrows only $9,500 but pays interest on $10,000. Now, the lender must give the borrower at least $9,750—that is, discount is limited by law to 2½%.

This means the persuasive effect of the ¼% jump in interest rate is a mirage. Loss of discount sometimes costs lenders more than the interest they gain.

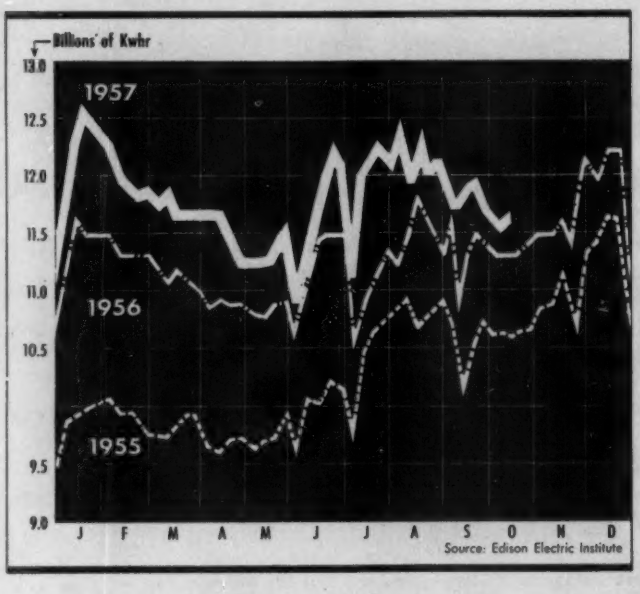
Albert M. Cole, FHA chief, will press for removal of discount ceilings next January when Congress reconvenes. If discounts go high enough, lenders will turn up to back FHA mortgages. But will buyers be able to afford the houses?

Only about 20% of U. S. families can afford a $10,000 house now, according to the National Housing Conference. Unless prices come down, it looks as though building will continue to lag behind the desire to build.

Only hope for a housing boost is the growing opposition to tight money. It should get stronger in 1958. And if money loosens up next year, it will tend to lower cost of houses. Not only would a drop in interest rates cut the real cost of the mortgage, but the lower cost of money borrowed by the builder (which has been passed along) could be deducted from list price.



STATISTICS



OUTPUT

Week ended October 12,
11,709,000,000 Kwhr
Up 3.6%

Per Cent Change From Previous Year

	Sept. 28	Oct. 5	Oct. 12
Total U. S.	+2.9	+2.0	+3.6
New Eng.	+4.1	+3.6	+6.6
Mid. Atlan.	+3.3	+1.1	+3.5
Cent. Ind.	+1.7	+0.8	+1.4
West Cent.	+2.5	+3.3	+5.5
Southeast	+5.0	+4.3	+4.7
South Cent.	−1.2	−3.2	+1.3
Rocky Mount.	+0.9	+2.1	+3.2
Pacific			
NW	+1.6	+1.0	+3.8
SW	+6.7	+5.4	+7.7

Seasonally Adjusted Index 226.9
Week Ago 222.3
Year Ago 218.1

Atomic Energy Commission requirements—1,050,000,000 Kwhr (Electrical World estimate). Excluding AEC, output increase was 4.8%.

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Aug.	125.75	124.99	118.01	6.6
Peak—Class 1 Systems.. million kw....	May	97.8	97.7	92.8	5.4
Estimated Dec. '57 Peak.	July	113.2	113.6	114.4	— 1.0
Production—billion kwhr	Aug.	55.45	54.35	52.19	6.2
Hydro		10.03	10.81	9.54	5.1
Fuel		45.42	43.54	42.66	6.5
Sales—billion kwhr	June	46.99	46.60	44.46	5.7
Residential		11.91	11.86	11.02	8.1
Commercial		7.90	7.38	7.29	8.4
Industrial		24.64	24.89	23.72	3.9
Other		2.54	2.48	2.42	5.0
Fuel Consumption	Aug.				
Coal—million tons		13.33	12.72	13.18	1.1
Oil—million barrels		5.79	5.51	5.18	11.8
Gas—billion cu ft		160.96	158.91	142.04	13.3
Net Income Class A & B Co's $—million	July	100.92	109.69	96.19	4.9
Residential Customers—millions	12 mos	46.35	46.26	45.09	2.8
Revenue per kwhr	ended	2.58¢	2.58¢	2.61¢	−1.1
Avg kwhr per customer	July 31	3,082	3,063	2,900	6.3
Avg annual bill		$79.52	$79.03	$75.69	5.1

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Aug.	144	135	142	1.4
ENR Construction Cost	Oct.	154.5	154.7	147.6	4.7
BLS Cost-of-living	Aug.	121.0	120.8	116.8	3.6
New Orders for Machinery (1950=100)	Aug.	134	147	142	−5.6
NEMA Sales					
Insulation materials	Aug.	134	127	153	−12.4
Electric appliances		86	101	100	−14.0
Wholesale prices	Aug.				
Motors and generators		142.5	142.5	133.3	6.9
Transformers and regulators		150.6	150.6	139.7	7.8
Switchgear and fuses		166.9	166.9	153.8	8.5
GNP—annual rate—$ billion	2nd qtr.	434.4	429.1	410.8	5.7

MANAGEMENT BULLETIN

FINANCE ▶ **The recent nose-dive of common stocks on the New York Stock Exchange**—the worst since Oct. 10, 1955, when President Eisenhower suffered a heart attack—has stimulated an investor switch to the bond market. This was reported to EW by a leading official of a large underwriting house.

He said that unsold bonds on underwriters' shelves were diminishing at a "fairly good clip" this past week. This was particularly true, he pointed out, of tax-exempt bonds of local governments.

With the volume of new electric utility and other issues coming to the market, he thought that underwriters are now in better condition to take on all the new financing that is scheduled to come up.

RATES ▶ **An application by the Narragansett Electric Co for a $2,678,000 a year** general rate increase has been denied by the Rhode Island Department of Business Regulation.

Narragansett has both interstate and intrastate operations and the company claimed that on its Rhode Island business it earned a return between 4.05% and 4.58%, depending on the rate base used. Proposed rate increase would have raised this to either 5.05% or 5.71%.

Principal reasons for denying the company's plea for higher rates were based on the claim that there was a depreciation reserve deficiency of some $5 million thus raising the depreciation reserve to be deducted from the rate base from $20 to $25 million.

By increasing the interstate rate base by some 20%, and showing a loss on the interstate operations, the Rhode Island business was then made to show an indicated return of 5.84%.

With respect to the cost of capital, the Administrator's witness said that this would vary between 5.26% and 5.40%, adding that "the fair cost of money was equivalent to a fair rate of return."

Administrator's own determination of the cost of money was 5.39% but he noted that since the rate of return should be over and above this amount he would allow an indicated return of 5.84% to stand.

Assailing the decision as "amazing and disappointing", Ralph E. Nock, company vice president and general manager, said it would be appealed to the Rhode Island Supreme Court.

EMPLOYEE RELATIONS ▶ **IBEW has nearly doubled its membership in the past ten years.** Total membership has now passed the 700,000 mark, IBEW Pres Gordon M. Freeman has just announced.

• • •

An Arizona Superior Court has ruled that no person can be denied work because of non-membership in a union. A $50,000 verdict against the Sheet Metal Workers International Association was returned, claiming the union was in violation of Arizona's right-to-work law. It was brought by Carl Nicholas, Los Angeles sheet metal worker, who asked $15,000 compensatory damages and $35,000 punitive damages. Union will appeal. Jury took three hours to reach a verdict.

Nicholas contended he was fired from his Arizona job because he was not a member of the union and claimed the union used its influence to keep him from getting a job in his line of work.

Earlier, the union had attempted unsuccessfully to have the state supreme court block the trial, claiming state courts have no jurisdiction in cases involving labor laws.

Public opinion is against forced union membership, a recent survey shows. American Institute of Public Opinion says more than six out of every ten voters (63%), would vote for right-to-work laws. Among union members, however, poll reported almost the opposite with 61% against such laws.

• • •

A protection program booklet for employees and their families has just been issued by the American Gas & Electric System. It gives details on the retirement plan, group life insurance, and the medical plan. For copy, write Philip Sporn, AG&E, 30 Church Street, New York City.

CO-OPS ▶ **Electric co-ops and other REA borrowers may need a billion dollars a year** new capital within the next decade, predicts REA Administrator David Hamil. Congress may not be willing indefinitely to meet such large demands, he warned, urging borrowers to build net worth and plant for a sound financial future.

SAFETY ▶ **First safety course for experienced utility safety men** has been conducted at Georgia Institute of Technology. Sponsored by the Southeastern Electric Exchange for its members, the 5½-day course was designed to help safety engineers in solving their problems. The cost was $225 per man.

Attending the first course were 17 safety directors and engineers from 13 Southeastern companies. One participant said that the course was so valuable that he would like to return if it is offered next year.

Curriculm for the course covered: Resuscitation, safety considerations in an atomic energy program, other protective equipment, underground hazards, detection of gases in UG vaults (demonstration), pole-top resuscitation (demonstration), rubber protective equipment, accident costs, industrial injury reporting (ASA Z16.1), compiling industrial accident causes (ASA Z16.2), public safety aspects of electric utility operations, insurance in electric utility operations, behind the accident, industrial relations, conference leadership, effective use of visual aids, personal development, and engineering for safety.

HOME IMPROVEMENT ▶ **"A generation of neglect has made every house a prospect** for repair or modernization," says Fred C. Hecht, chairman of the Home Improvement Council. "People in old houses are already dissatisfied. All we have to do is show them that they can enjoy new-home living at their old address."

This is the object of a $250,000 contest to be sponsored next year by the newly formed Home Improvement Council (EW, Sept. 30, p 102).

Local action will play an important part in the program. Utilities, dealers, contractors, and money-lenders who join the Home Improvement Council can tie their own promotions into the "How's Your House" contest and display the seal. Utility membership costs $50.

A lineal descendent of "Operation Home Improvement", but set up to be permanent, HIC will beam its program directly at the consumer. In addition to the contest, its activities will include public relations, communication within the home-improvement industry, and research into the size of the market and what motivates people to improve their homes.

Consider

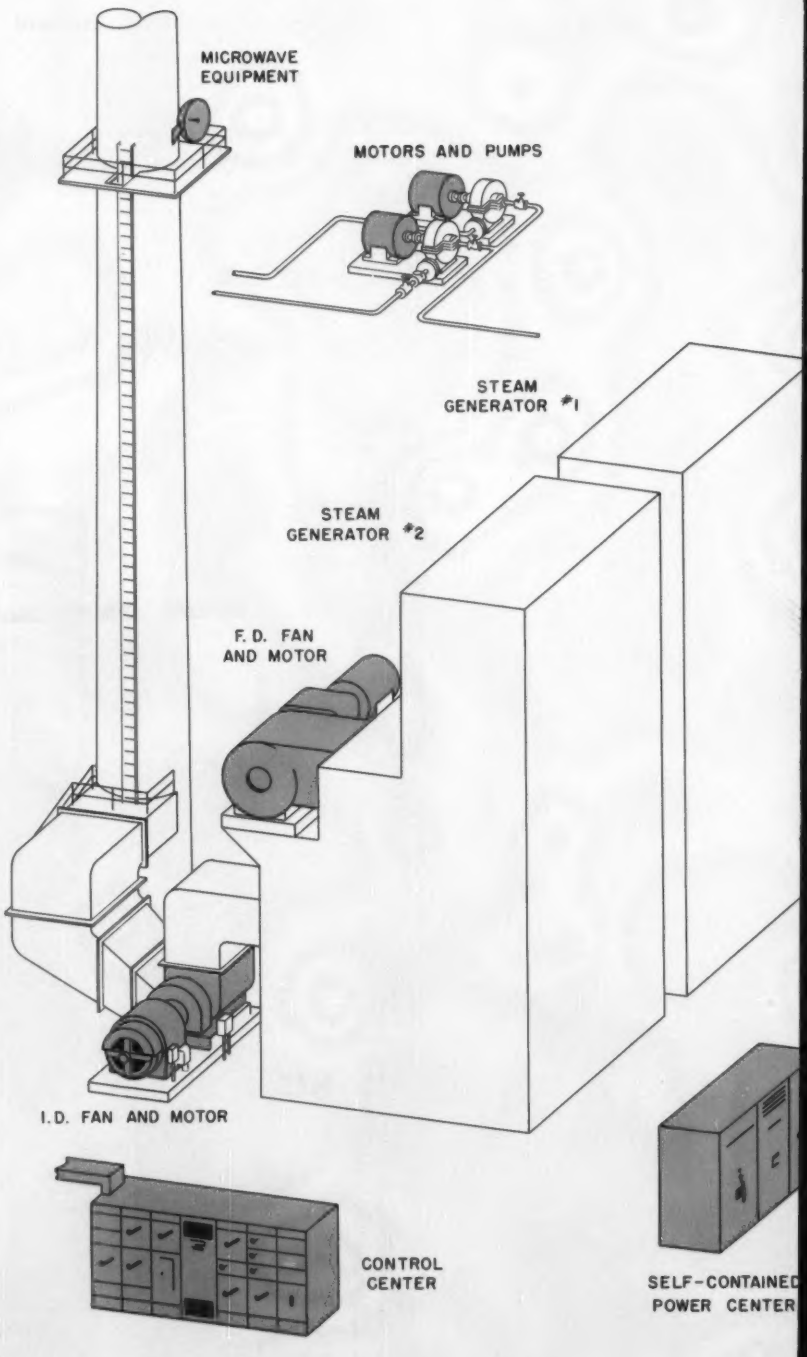
the advantages of one responsibility for your next power station!

Tom Fort, Vice President,
Apparatus Division,
Westinghouse Electric Corporation

Westinghouse apparatus available for power plant applications

Air Conditioning Equipment
Arc Welders
Atomic Reactor and Auxiliaries
Automatic Dispatching Equipment
Battery Chargers
Bus Duct
Circulating and Condensate Pumps
Control Boards
Control Centers
Coupling Capacitors, Line Traps and Potential Devices
Crane Motors and Controls
Cypak* Annunciators
Disconnecting Switches
Elevators—Passenger and Freight
Evaporators
Fans
Feedwater Heaters
Gear Speed Increasers
Gear Speed Reducers
Generators, Main and Auxiliary
Generator Voltage Regulator
Group Phase Bus
Instruments
Instrument Transformers
Isolated Phase Bus
Lighting Equipment
Lightning Arresters
Meters
Microwave Equipment
Panelboards
Precipitron®
Power Centers
Power Circuit Breakers
Powerhouse Motors
Power Line Carrier and Tone Equipment
Reactors, Current Limiting
Relays
Self-Contained Power Centers
Standard Motor Controls
Steam Condensers
Steam Jet Air Ejectors
Supervisory Control
Surge Protection Equipment
Switchboards
Switchgear
Switchyard Structure
System Grounding Equipment
Telemetering Equipment
Transformers, Main and Auxiliary
Turbines, Steam or Gas, Main and Auxiliary
Unit Heaters
Ventilating Fans
Water Coolers

*Trade-Mark



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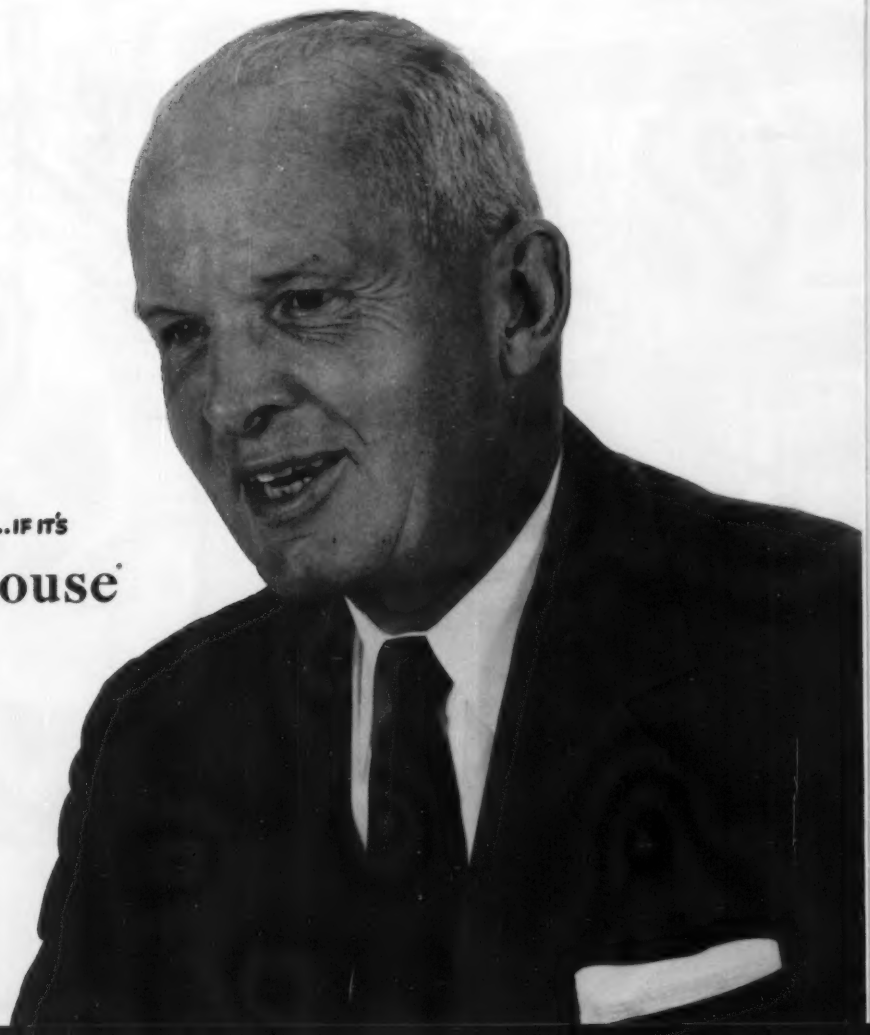
Think of the time, trouble and processing you can save with:

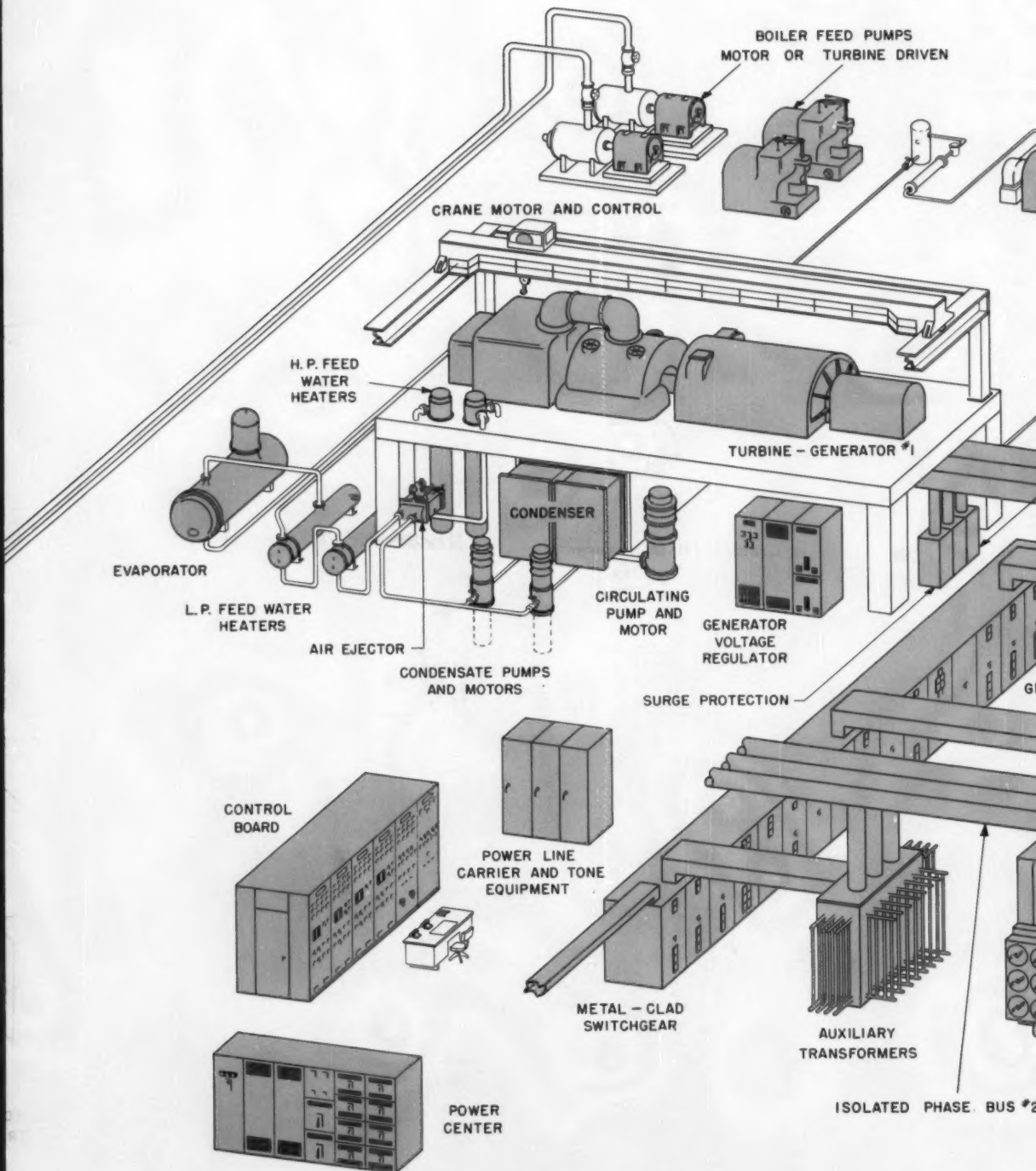
ONE ORDER
ONE CONTACT
ONE RESPONSIBILITY



YOU CAN BE SURE... IF IT'S

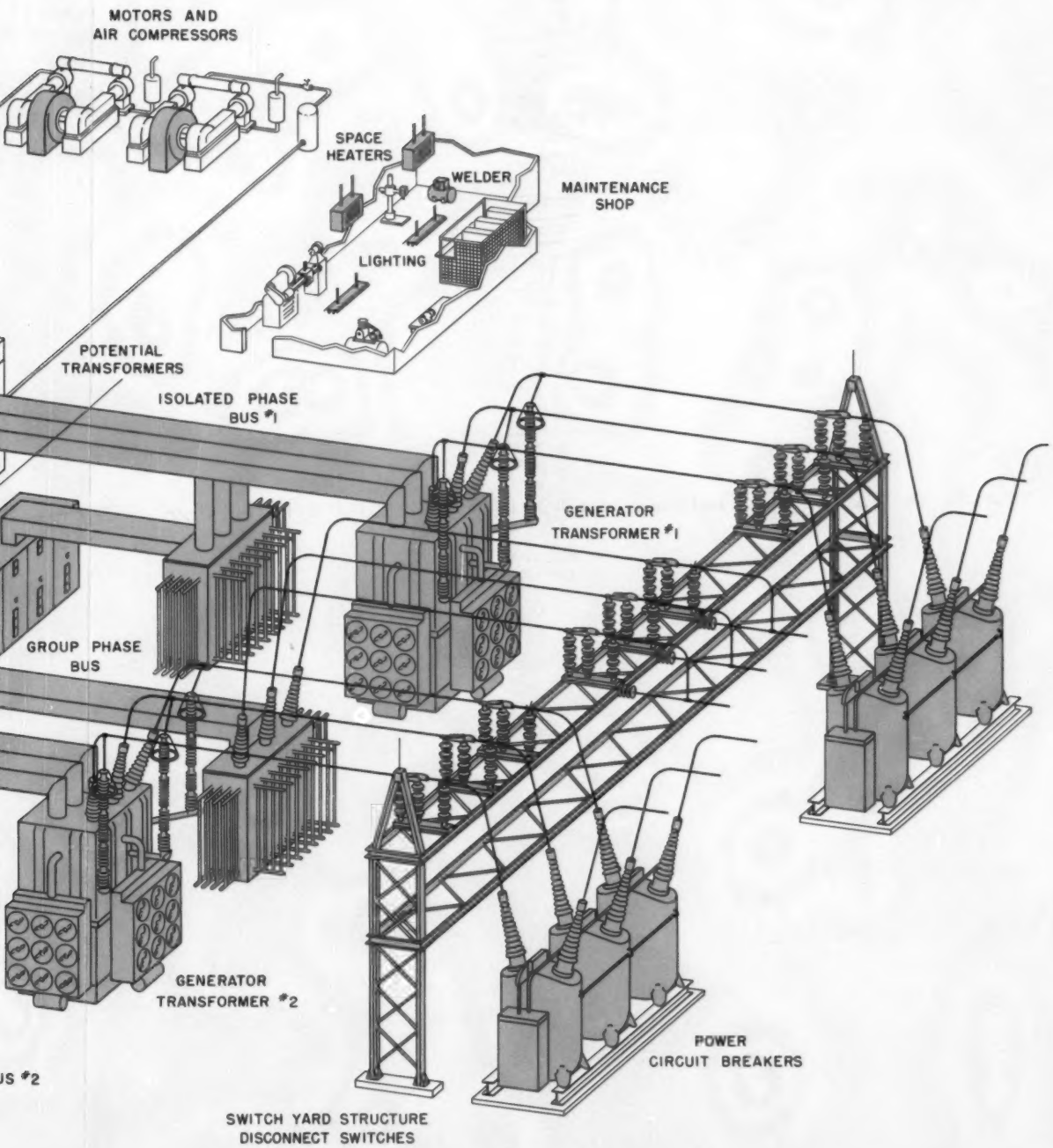
Westinghouse

ONE ORDER, ONE CO



A print of this artwork, suitable for framing, is available free of charge; write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

ONTACT, ONE RESPONSIBILITY



When you place an order with Westinghouse you take advantage of a unique organization

FOREMOST IN RESEARCH

Westinghouse research leads the industry, probing for new knowledge.

FOREMOST IN DEVELOPMENT

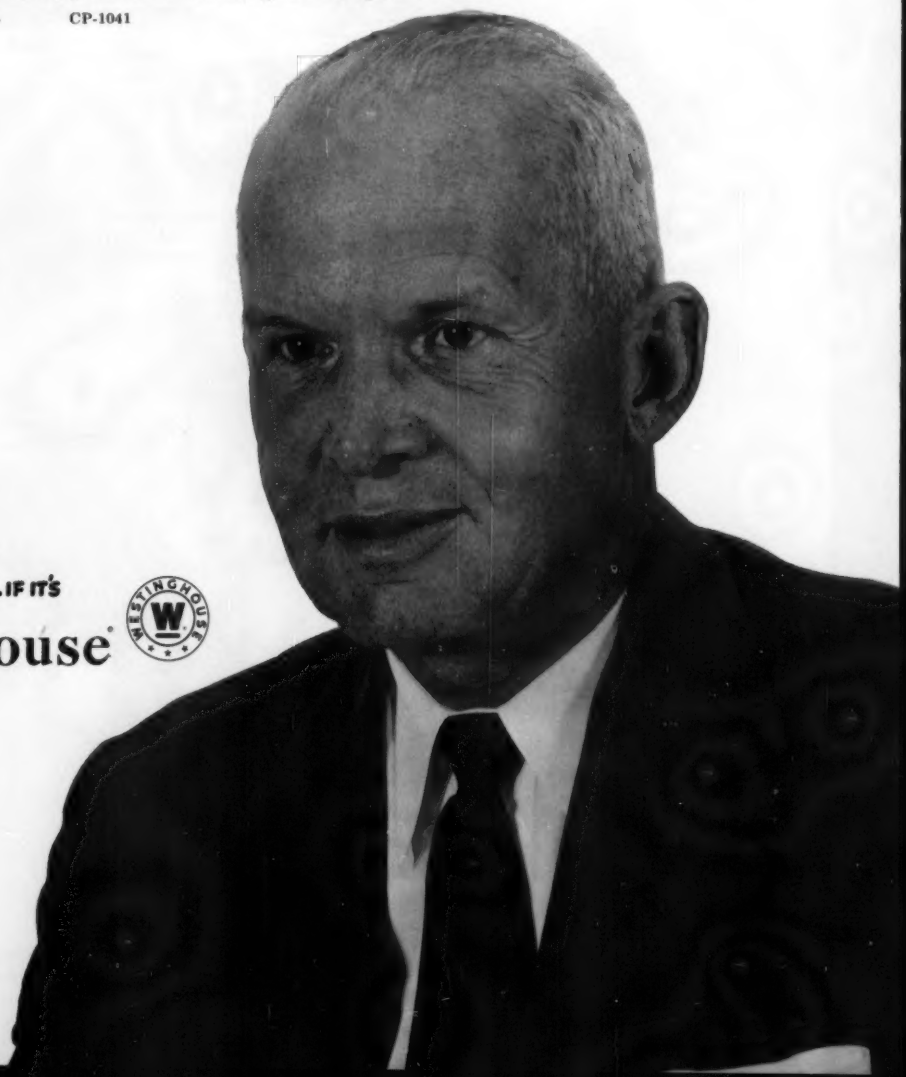
Product development is the practical application of Westinghouse research.

FOREMOST IN ENGINEERING

Noted for engineering excellence, Westinghouse has a depth of experience that can be gained only through years of *living* the problems of the electrical industry.

IT'S ALL ONE

The broad scope of Westinghouse stands ready to cooperate with you and your consultants. Your orders to Westinghouse not only take advantage of all this research, development and engineering, they support it, too. One man, your local Westinghouse representative, is your key man to it all. CP-1041



YOU CAN BE **SURE**...IF IT'S

Westinghouse

MEETINGS CALENDAR

OCTOBER

American Society of Mechanical Engineers—Power Conference, American Hotel, Allentown, Pennsylvania, Oct. 21-23.

National Safety Congress—Conrad Hilton Hotel, Chicago, Ill., Oct. 21-25.

Edison Electric Institute—Accounting Division Taxation Accounting Committee, held jointly with AGA, Williamsburg, Virginia, Oct. 23-25.

Engineers Council for Professional Development and Engineers Joint Council—General Assembly, Statler Hotel, New York City, Oct. 24-25.

Pennsylvania Electric Association—Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., Oct. 24-25; Transmission & Distribution Committees, Lord Baltimore Hotel, Baltimore, Md., Oct. 31-Nov. 1.

Oklahoma Utilities Association—Electric Light and Power Division, Woodward, Okla., Oct. 25; Eastern District, Bartlesville, Okla., Oct. 25.

American Power Dispatchers Association, Inc—Fall National Meeting, Fresno, Calif., Oct. 25-26.

National Management Association—34th National Conference, Penn-Sheraton Hotel, Pittsburgh, Pennsylvania, October 25-26.

Atomic Industrial Forum—Annual Conference, Coliseum, New York City, Oct. 28-30.

American Nuclear Society—Winter Meeting, New York City, Oct. 28-30.

The University of Texas—10th Annual Power Distribution Conference, Austin, Texas, Oct. 28-30.

National Association of Railroad Utilities Commissioners—Annual Conference, Peabody Hotel, Memphis, Tennessee, October 28-31.

American Institute of Electrical Engineers—3rd Annual Farm Electrification Conference, Hotel Nicollet, Minneapolis, Minn. Oct. 29-31.

Industrial Management Society—21st Anniversary Industrial and Management Clinic, Hotel Sherman, Chicago, Ill., Oct. 30-Nov. 1.

Institute of Radio Engineers—3rd Annual Technical Conference of the Professional Group on Electron Devices, Shoreham Hotel, Washington, D. C., Oct. 31-Nov. 1.

NOVEMBER

American Institute of Mining, Metallurgical, and Petroleum Engineers—Metals Division Fall Meeting, Morrison Hotel, Chicago, Nov. 3-7.

American Institute of Electrical Engineers—Ninth Annual Machine Tool Conference, Hotel Schroeder, Milwaukee, Wis., Nov. 4-6; Conference on Magnetism & Magnetic Materials, Sheraton Park Hotel, Washington, D. C., Nov. 18-21.

Edison Electric Institute—Accident Prevention Committee, Penn-Sheraton Hotel, Pittsburgh, Pa., Nov. 6-8; Area Development Committee, Phoenix Hotel, Lexington, Ky., Nov. 9; Southern Region Home Service Workshop, Atlanta, Ga., Nov. 12-13; Commercial Lighting Committee, Washington, D. C., Nov. 14-15; Accounting Division Advisory and Executive Committees, The Cloisters, Sea Island, Ga., Nov. 14-15; Street Lighting Committee, Dayton, Ohio, Nov. 21-22; Industrial Power & Heating Group, Atlantic City, N. J., Nov. 21-22.

Pacific Coast Electrical Association—Hawaiian Conference, Reef Hotel, Honolulu, Hawaii, Nov. 7-8; Services Section, Villa Hotel, San Mateo, Calif., Nov. 13-14.

Pennsylvania Electric Association—Prime Movers Committee, Bedford Springs Hotel, Bedford, Pa., Nov. 7-8; System Planning Committee, Van Curler Hotel, Schenectady, N. Y., Nov. 7-8; Electrical Equipment Committee, Ben Franklin Hotel, Philadelphia, Pa., Nov. 14-15.

Institute of Radio Engineers—Third Annual Instrumentation Conference, Atlanta Biltmore Hotel, Atlanta, Ga., Nov. 11-13; Radio Fall Meeting, King Edward Hotel, Toronto, Canada, Nov. 11-13; Mid-America Electronic Convention, Municipal Auditorium, Kansas City, Mo., Nov. 13-14; New England Radio Engineering Meeting, Mechanics Bldg., Boston, Massachusetts, November 15-16.

National Electrical Manufacturers Association—Traymore Hotel, Atlantic City, N. J., Nov. 11-15.

American Standards Association—Eighth National Conference, St. Francis Hotel, San Francisco, Calif., Nov. 13-15.

Southeastern Electric Exchange — Accident Prevention Committee, Dinkler-Tutwiler Hotel, Birmingham, Alabama, November 14-15.

American Society of Refrigerating Engineers—44th Semi-annual Meeting, Shoreland Hotel, Chicago, Illinois, November 14-16.

Air Conditioning & Refrigeration Institute—10th Exposition, International Amphitheatre, Chicago, Ill., Nov. 18-21.

Electric Companies Public Information Program—Inter-Regional Committee, Mayflower Hotel, Washington, D. C., Nov. 19.

Public Utilities Association—Region II Annual Conference, Mayflower Hotel, Washington, D. C., Nov. 21-22.

DECEMBER

American Society of Mechanical Engineers—Annual Meeting, Statler Hotel, New York City, Dec. 1-6.

• **American Mining Congress**—Annual Membership Meeting, New York, N. Y., Dec. 2.

• **Edison Electric Institute**—Accounting Division Electronics Seminar, sponsored jointly with AGA, Sheraton Cadillac Hotel, Detroit, Mich., Dec. 2-4; Electric Space Heating and Air Conditioning Committee, Cincinnati, Ohio, Dec. 4-6; Industrial Relations Committee, sponsored jointly with New England Personnel Group, Sheraton Plaza Hotel, Boston, Mass., Dec. 5-6; Market Research Committee, Louisville, Ky., Dec. 5-6; Accounting Division Depreciation Committee, sponsored jointly with AGA, Lord Baltimore Hotel, Baltimore, Md., Dec. 9-10; Commercial Cooking & Water Heating Committee, Detroit, Mich., Dec. 12-13.

• **Electric Companies Public Information Program**—Steering Committee, New York City., Dec. 11.

• **Electric Companies Advertising Program** — Management Group meeting, New York City, Dec. 13.

• Additions this week.

Enter The 1957 International

Stories on top winning entries will be published in ELECTRICAL WORLD

Local publicity will stimulate lighting business!

$5,400.00 in cash prizes will be awarded!

Have you completed an outstanding lighting job since January 1st, 1956? Do you have one planned—or working—to be finished before October 25th, 1957? Why not let that job bring you extra profit . . . and industry-wide recognition? Enter it in the 1957 International Lighting Competition!

The competition is open to any individual who is either the owner or manager, or an employee of any of the following types of business, provided he complies with all the requirements outlined in the official rules of the competition: 1. Electrical Contractor. 2. Electrical Wholesale Distributor. 3. Architect or Engineer. 4. Electrical Utility.

The contest opens March 15th, and closes October 25th. Announcement of award winners will be made during the week of November 11, 1957.

The competition is sponsored by three McGraw-Hill publications: Electrical World . . . Electrical Construction and Maintenance . . . Electrical Wholesaling . . . with the cooperation of the National Lighting Bureau (National Electrical Manufacturers Association).

Commercial, industrial and institutional lighting installations winning cash prizes will be certified by the National Lighting Bureau, NEMA, providing the installation plans meet certification standards. Certificates will be presented to all cash prize winners, and honorable mention winners. In case of tie, duplicate awards will be made. Wherever practical, awards will be made locally; if possible at electrical group meetings.

Send in the coupon below for detailed information on the 1957 International Lighting Competition. Make your outstanding lighting job pay off in extra cash, and valuable public acclaim!

LIGHTING CLASSIFICATIONS:

Lighting installations are divided into six separate and individual groups. Separate awards will be made for each classification, within each contestant division. The installation classifications are:

1. **Industrial**
2. **Store**
3. **Office**
4. **Institutional**
5. **Outdoor Lighting**
6. **Residential Lighting**

PRIZE AWARDS:

The 120 cash prizes offered, total $5,400.00. There are five prizes for each of the six installation classifications, and these prizes are offered within each of the four contestant divisions. The prize awards for each classification and within each division:

First Prize: $100

Second Prize: $50

Three Prizes: $25 each.

JUDGING:

Competent and fair consideration for each entry has been assured through appointment of nine individuals, each a well-known authority in the field of illumination, to serve as judges. These individuals will form three panels of three members each, to judge the separate lighting classification groups. The decisions of the board with respect to awards and all other competition matters are final and binding on each participant. The competition and awards are subject to all applicable local, state and federal laws and regulations.

Lighting Competition!

OFFICIAL COMPETITION RULES:

RULE 1 – Application to enter the Competition must be made in writing. Applicant may use an Official Entry Application form, which will be supplied by the Lighting Competition chairman upon request. (In any case where the applicant is unable to obtain an Official Entry Application form, he may send in his request to enter by letter).

RULE 2 – Any individual–who may be the owner or manager, or an employee of any of the following types of business – may enter the contest. These types of businesses, which are to be known as Contestant Divisions, are: electrical contractor; electrical wholesale distributor; architect or engineer; and electric utility. Either individual or joint entries may be made; joint entrants must specify which Contestant Division they are entering.

RULE 3 – Entries must be made in one of the following Installation Classifications: industrial lighting; store lighting; office lighting; institutional lighting; outdoor lighting; residential lighting.

RULE 4 – Contestants or their firms must have been responsible for either the design, layout, sale or installation of the lighting installation covered by each entry. The contestant will state this eligibility by describing in detail in each entry the part he took in the design, layout, sale or installation. In the case of joint entries, each contestant must state in the entry the work for which he was responsible.

RULE 5 – A contestant may submit any number of entries.

RULE 6 – Each entry must cover one or more of the following:

a. A lighting installation for a single specific visual requirement.
b. A lighting installation for a specific area, large or small.
c. An overall lighting installation for an entire building, project or general area.

A lighting installation using any make, or brand, or type of electric lighting equipment, and based on any lighting system design or layout, regardless of whether such lighting equipment, lighting system design or layout conforms with recognized standards for good lighting practice, may be enter 1 in the Competition. The Board of Judges, however, will judge all entries based on those factors conforming with recognized standards of good lighting practice.

RULE 7 – Each entry must be submitted separately, in an official Competition Entry folder bearing an official Registration Number as assigned by the Competition chairman.

RULE 8 – All entries, to be eligible in the Competition:

a. Must be mailed on or before the closing date of the Competition (October 25, 1957), and must be received by the Competition chairman on or before November 4, 1957.
b. Must cover lighting installations completed within the period between January 1, 1956 and October 25, 1957.

RULE 9 – In submitting an entry, the contestant agrees to be bound by all rules of the Competition, and to abide by the decision of the Board of Judges, which will be final. All entries become the property of the sponsors of the 1957 International Lighting Competition, and no entry will be returned. All entrants, by submitting entries, further agree to grant the sponsors full reproduction and publication rights.

MAIL THIS COUPON FOR RULES AND ENTRY FORMS:

Berlon C. Cooper, Chairman
1957 International Lighting Competition
330 West 42nd Street
New York 36, N. Y.

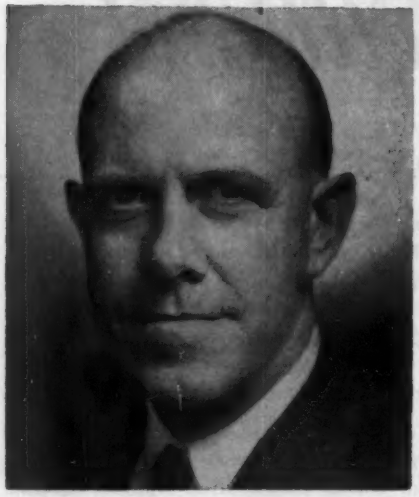
Please send me the rules brochure and _____ entry forms for the 1957 International Lighting Competition.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____



BYRON O. McCOY

Vermont Electric Power Co Appoints McCoy to VP Post

Byron O. McCoy has been elected vice president in charge of operations for Vermont Electric Power Co. He will have complete responsibility under Pres Albert A. Cree for the construction, maintenance, and operation of the new transmission system now being built to transmit St. Lawrence power to the state.

A graduate of Dartmouth College and its Thayer School of Engineering, McCoy has been associated with the engineering firm of Chas. T. Main, Inc, since 1942. He has supervised the design and construction of many hydroelectric generating facilities and has made power supply and load studies for the former Consolidated Gas, Electric Light & Power Co, (now Baltimore G&E), and Virginia Electric & Power Co.

Maechtlen Rises to First VP

LAWRENCE G. MAECHTLEN

Lawrence G. Maechtlen, vice president and a director of Square D Co since 1951, has been elected as first vice president of the company. In his new capacity he will report directly to Pres Gordon Patterson and will function from the Detroit executive offices.

For the past three years Maechtlen has been manager of the firm's Western Division, with headquarters in Los Angeles.

Since joining the company in 1926, he has served in a number of positions of increasing responsibility. Starting as a draftsman, he advanced to chief engineer, works manager, district manager, sales manager, and manager of the Western Division.

A graduate of California Institute of Technology, Maechtlen is a past president of the Los Angeles Electric Club and is a director of the Pacific Coast Electrical Association.

Two Vice Presidents Named by Consulting Firm

H. H. FITZGERALD

LEONARD MILANO

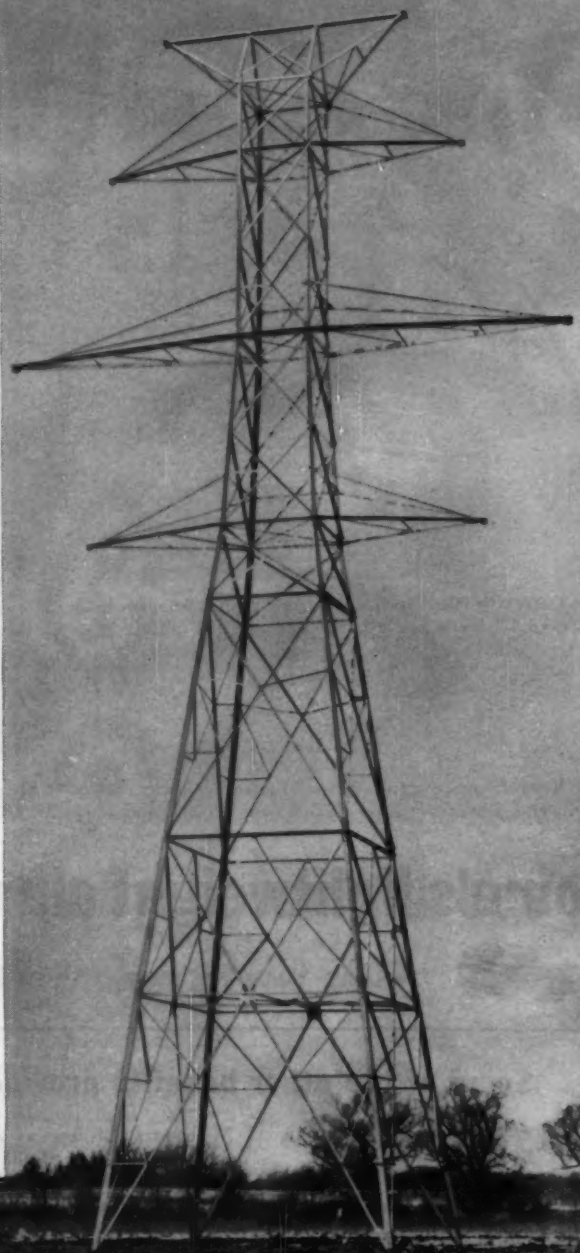
Commonwealth Services, Inc, management and engineering consulting firm, has announced the recent election of Harry H. Fitzgerald and Leonard Milano as vice presidents of the company. They assumed their new positions on October 1.

Fitzgerald, as vice president, has been given responsibility for the company's Houston, Texas, office. He is a graduate of Michigan State College, where he received a bachelor of science degree in chemical engineering.

Milano, a graduate of Massachusetts Institute of Technology, is a director of the Berkshire Gas Co of Pittsfield, Mass., and Quebec Natural Gas Corp of Montreal, Canada.

USS MAN-TEN High Strength Steel SAVES 165 TONS OF TOWER WEIGHT

for Niagara Mohawk Power Corp.



IT'S THE NEW 230-kv line running from Tonawanda to Gardenville, New York. 138 towers were required, with average height of 123 feet. USS MAN-TEN Steel was used in the main legs and for some of the main bracing of every one of these towers. As a result, weight was saved.

AND COSTS WERE REDUCED

USS MAN-TEN's high yield point—50% higher than structural carbon steel—made it possible to reduce the thickness of important structural members without sacrificing strength or durability. The great strength of USS MAN-TEN cut the weight of each tower by 2400 lbs., on the average—about 5% of the total weight. This cut shipping costs and made the towers less costly to erect.

Each of the towers weighs about 24½ tons. Total weight for all 138 is 3,380 tons. USS MAN-TEN Steel accounts for less than a third of this weight. Yet, its use results in a total weight saving of 165 tons!

LET IT CUT YOUR COSTS

In addition to high strength, USS MAN-TEN Steel brings you much greater abrasion resistance and 40% higher fatigue strength than structural carbon steel. In addition, it has good resistance to atmospheric corrosion! That is why it is being used widely for transmission towers, television towers, bridges, and other structures.

FREE BOOKLET—Send for our 174-page "Design Manual for High Strength Steels." It is an invaluable guide to cost-cutting uses of USS Man-Ten, USS Cor-Ten, and USS Tri-Ten High Strength Steels. Write on your company letterhead to United States Steel, Room 2801, Pittsburgh 30, Pa.

United States Steel Corporation, Pittsburgh
American Steel & Wire Division, Cleveland
Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh, Pa.
Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

UNITED STATES STEEL

USS, COR-TEN, MAN-TEN, and TRI-TEN are registered trademarks.

Easier to Handle. The lightweight construction of Rome's aluminum Triplex makes it easier to handle and quicker to install than open-wire drops.

Neater Appearance. This self-supporting service drop cable offers neat appearance of a single cable assembly compared to open wires.

Rome's lightweight aluminum Triplex goes up

Some of the other benefits provided by this service cable

The construction features of Rome's aluminum Triplex lead to still more savings:

Costs less. Initial cost is lower than conventional copper Type SD service drop cable.

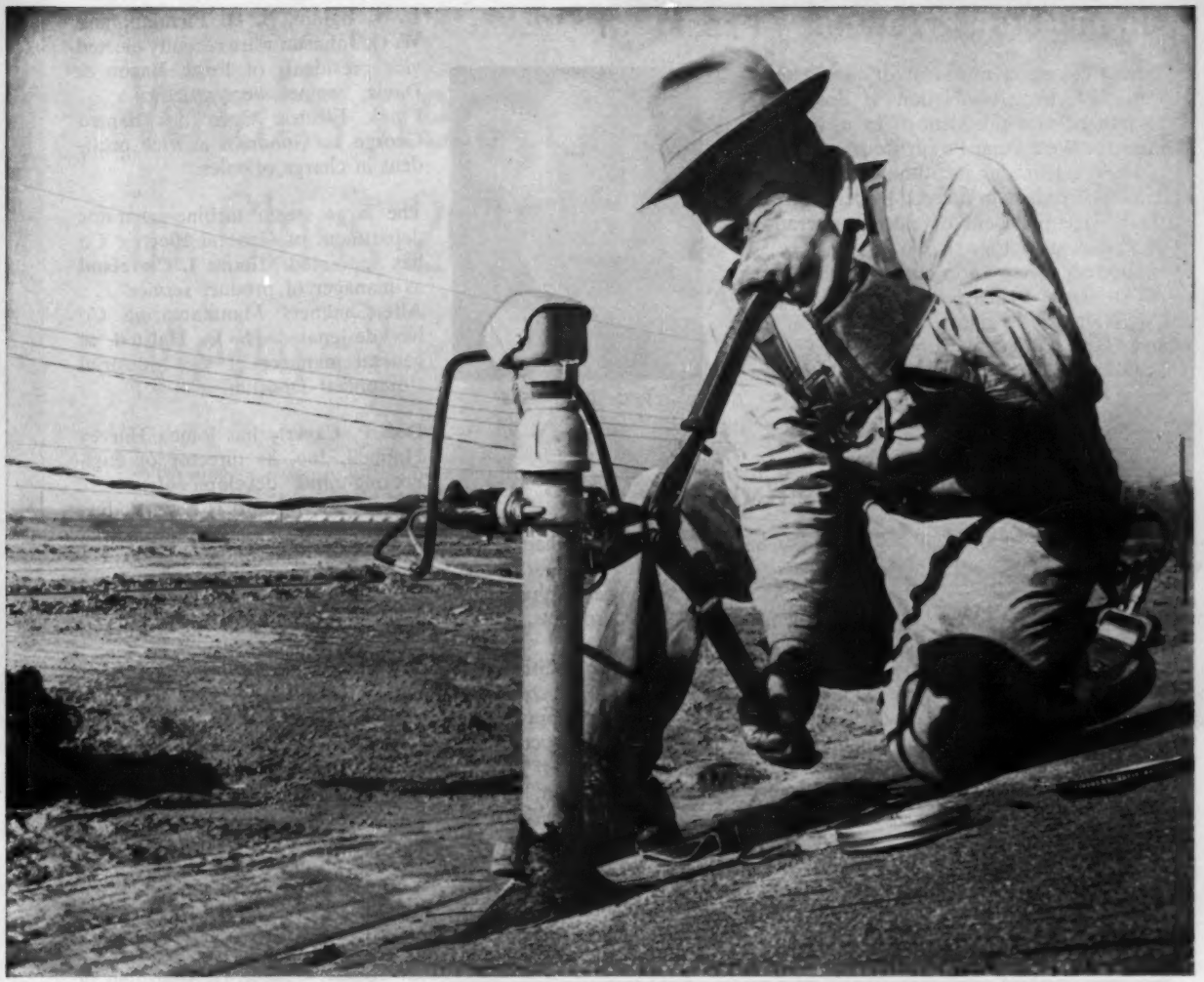
Lasts longer. Maintenance and service interruptions are few compared to open-wire installations. It offers maximum resistance to storms, wind, and ice loading.

Fewer poles required. Fewer poles are required and longer spans are possible with mid-span taps on secondary Triplex.

Less hardware needed. Service tap connections at the pole require less hardware than a conventional three-wire tap.

You have a choice of Roprene (neoprene) or Rolene (polyethylene) insulation. Either one withstands the severe effects of sunlight, heat, moisture, corrosive atmosphere, and other common hazards.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information —or write to Department 366-A.



much faster than open-wire service drops

That means real savings in on-the-job manpower costs

Reduce your service-drop installation time—even by a few minutes—and you save money. Now it's possible to speed up practically every job.

High dollar savings. Rome's aluminum Triplex can be installed much faster than open-wire service drops. Multiply the time it saves by the high cost of keeping your crew on the job, and you'll see how great the savings are in manpower costs alone.

Why such savings are possible. The lightweight construction of Rome's aluminum Triplex is behind these important savings. This single cable assemby weighs less than conventional copper three-wire service drops, so it's easier to handle and quicker to install.

Rome's aluminum Triplex offers simplicity in construction. A self-supporting cable, it consists of specially insulated power conductors spiralled around a "straight-away" neutral conductor. Less handling is required to pull it off the truck, string it, and connect it than conventional three-wire service drops.

You can purchase this economical service drop cable in handy 500-foot cartons, paper-wrapped coils, or on non-returnable reels.

Specify Rome's aluminum Triplex for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 366-A and ask for Bulletin RS-5. Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

Chambers is New PEA President

Newly elected president of the Pennsylvania Electric Association is Joseph O. Chambers, vice president of industrial relations for West Penn Power Co.

PEA, celebrating its 50th annual meeting, named Chambers to succeed Robert P. Liversidge, vice president of electric operations of Philadelphia Electric Co.

Elected as vice presidents of PEA were A. D. Root, Pennsylvania Power & Light Co; Walter J. Lyman, Duquesne Light Co; and G. R. Parry, Metropolitan Edison Co. Franklin H. Lichtenwalter continues as managing director.

J. O. CHAMBERS

Chance Co Advances Ryman

E. G. RYMAN

A. B. Chance Co has promoted E. G. Ryman from regional sales manager to vice president and general manager of the Carey, Ohio, plant of Porcelain Products, Inc, a subsidiary.

Ryman, whose new responsibilities start about November 1, will be in charge of managing all phases of the plant's operations, including manufacturing, sales, accounting, engineering, and personnel.

A 23-year Chance Co veteran, Ryman most recently served as regional sales manager for 11 Western states, Hawaii, and Alaska.

PERSONAL BRIEFS

Dallas Power & Light Co has assigned Secretary **H. G. Elmore** the added duties of treasurer. **W. A. Hall** becomes assistant secretary . . . **Wallace M. Harrell** is new treasurer of Arkansas Power & Light Co.

R. W. Steele has been elevated to assistant to the president of Interstate Power Co and **L. L. McNeil** to chief production engineer.

J. R. Thomas will become manager of Ohio Power Co's Portsmouth district on November 1 . . . Consumers Power Co has named **Robert E. Armstrong** distribution operating engineer, general office.

At Oklahoma Gas & Electric Co, **Haskell J. Mogridge** has been named assistant manager of the Western Division and **Joel C. Kelley** general supervisor of customer accounting.

Houghton R. Hallock, retired colonel in U. S. Army Corps of Engineers, has been elected executive vice president of Texas Atomic Energy Research Foundation . . . Yankee Atomic Electric Co has named **Frederick D. Kenison** as field representative at the project site in Rowe, Mass. **Dennis K. Feldtmose** was appointed Yankee project manager by Stone & Webster Engineering Corp.

TVA's Division of Power Engineering and Construction has as its new director **K. E. Hapgood,** former assistant to the director . . . **Miller Evans** has been named director of Bonneville Power Administration's Operations and Maintenance Division. **Howard J. Ashe** becomes Evans' assistant and **Jess J. Sitton** has been designated as chief of plant services.

L. S. Baldin, S. R. Fleming, and **W. O. Johnson** were recently elected vice presidents of Ford, Bacon & Davis, engineers-constructors . . . Frank Electric Corp has named **George E. Goodrich** as vice president in charge of sales.

The large steam turbine-generator department of General Electric Co has appointed **Mimms I. Cleveland** as manager of product service . . . Allis-Chalmers Manufacturing Co has designated **H. L. Halsted** as general manager of the Industrial Equipment Division.

Don P. Caverly has joined Harvey Hubbell, Inc, as director of engineering and development . . . **John J. McDermott** is new production manager of Babcock & Wilcox Co's Barberton, Ohio, works.

Richard M. Clifford is new manufacturing manager of the Electrical Products Division of Corning Glass Works.

At Nordberg Manufacturing Co, the Engine Division has appointed **Robert F. Gibson** as manager and **E. Ray Hester** as assistant manager of the installation and service department.

OBITUARY

G. Stewart Crane, 69, chairman of the board of directors of Cutler-Hammer, Inc, died of a heart attack in Milwaukee.

Frank R. S. Kaplan, 71, chairman of the board and chief executive officer of Copperweld Steel Co, died recently at his Pittsburgh, Pa., home.

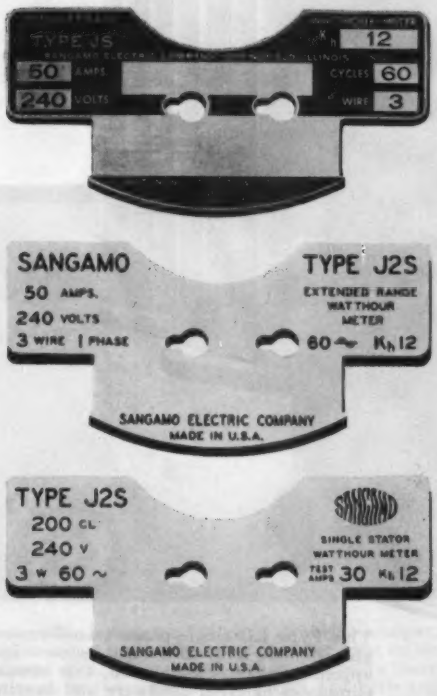
Eugene A. Yates, 76, chairman of the board of the Southern Co, died recently in his New York City apartment. Yates, one of the principals in the Dixon-Yates controversy, was a pioneer in the development of hydroelectric resources in the Southeast. He formerly was vice president and chairman of the board of Georgia Power Co, vice president of Commonwealth & Southern Corp, chief engineer of Alabama Power Co, and general manager of Alabama Power and Southeastern Power & Light Co, and president of South Carolina Power Co.

What's new in Class 200 Meters?

With more and more 200 ampere service entrance equipment being installed every day, it's sound practice to match service capacity with metering capacity.

The Sangamo Class 200 Meter can accurately measure all loads—from a few watts to full 200 ampere capacity. Yet the development of 200 ampere capacity meters is nothing new with Sangamo. The Class 200 Meter is backed by 17 years of *proven performance.*

THE NAMEPLATES TELL THE STORY...



IN 1940

Sangamo introduced the Type J Meter, a radical departure in singlephase meter design. It accurately registered loads as great as 200 amperes. The 50 amp. J Meter gave excellent load curves up to such loads as the current carrying capacity of the terminals would allow. These J Meters are on your system—available to do tomorrow's job.

IN 1955

Sangamo developed the J2 Meter—the first extended range meter—a refinement of the basic J Meter. The Type J2 incorporated many improvements over the Type J... increased bearing life, higher resistance to surge voltage, superior voltage characteristics, improved corrosion resistant finishes and materials. The 50 amp. J2 Meter offered straight line accuracy to 200 amperes with only 18 starting watts. These meters are on your lines—ready and waiting for bigger loads.

NOW

Sangamo builds its proven 200 ampere meter as the Class 200, 30 Ampere J2S Meter—with proven accuracy to 200 amperes, lower disk speed, high starting torque, low starting watts.

Make this *proven* Class 200 Meter first choice to measure your ever growing needs. For further information and prices, contact your nearest Sangamo Representative, or write us.

JM57-7

SANGAMO
Electric Company

SPRINGFIELD, ILLINOIS

THE MOST MODERN DESIGN

This Type LD single-phase transformer—available 250-500 kva, 15 kv and below—improves appearance. Functional, too, this streamlining eliminates external hardware and bracing, aids cleaning and routine maintenance, retards corrosion. Cooling oil is reduced by 35%, transformer weight 27%.

IN SUBSTATION TRANSFORMERS...

NEW

tank, coolers, core, coils; installation area reduced up to 37%, weight cut up to 27%

The latest development in substation distribution, the Westinghouse Type LD transformer, is completely new . . . new base, new bushings, new coolers, new core-and-coil assembly, new tank with exclusive sealing weld at bottom. These features make possible new economies, savings in installation space, maintenance, and inspection.

Longer service life—Low ground capacitance gives more evenly distributed surge voltages—means extra resistance to voltage breakdown. Liberal cooling ducts prevent possibility of hot spots and associated insulation failure. Result—longer coil life.

Smaller, lighter—By preventing abnormally high-voltage stress during surges, Lowgrocap* makes excessively heavy insulation on the coil end turns unnecessary, resulting in smaller, lighter coils. D-shaped cross section of magnetically superior Hipersil® core permits maximum utilization of tank space. Special configuration of wooden end frames with tie rods placed next to core keeps all non-insulating materials away from coil—results in assembly of basically higher insulation strength, and facilitates bringing out both H. V. and L. V. leads.

*Trade-Mark

Less installation area required—Flat, fin-type coolers, more efficient than round tubes, allow placing all cooling on one side only, away from L. V. bushings and cables. Following, are the typical reductions in physical dimensions made possible.

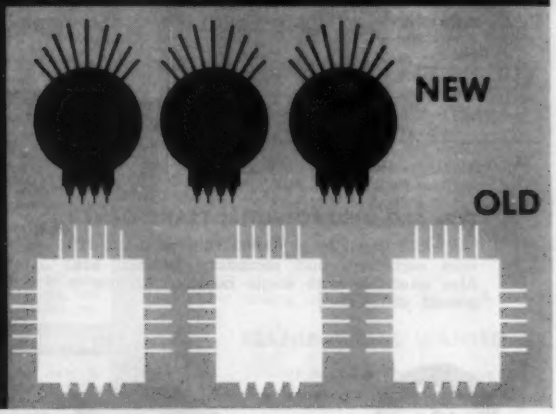
KVA	WIDTH AND BASE AREA REDUCED		HEIGHT REDUCED		WEIGHT REDUCED	
	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
250	15%	21%	10%	17%	23%	27%
333	15%	25%	8%	14%	22%	26%
500	15%	37%	1%	12%	18%	21%

Ease of inspection, maintenance—This modern design with tank weld at bottom permits easier, more complete inspection. Eliminating necessity of disturbing core and coils in simplified untanking procedure minimizes possibility of damage and contamination.

For further information about the new type LD transformer, call your Westinghouse representative . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70817

YOU CAN BE SURE...IF IT'S Westinghouse

New D core with Lowgrocap winding provides compact unit assembly. The outer layer of paper insulating tape on each individual strand of H. V. copper is impregnated with a thermosetting plastic, as is the glass tape banding the coils together. When heated, this bonds the coils into a unit of extraordinary strength. Also clogged cooling ducts are prevented since no varnish treatment is necessary.

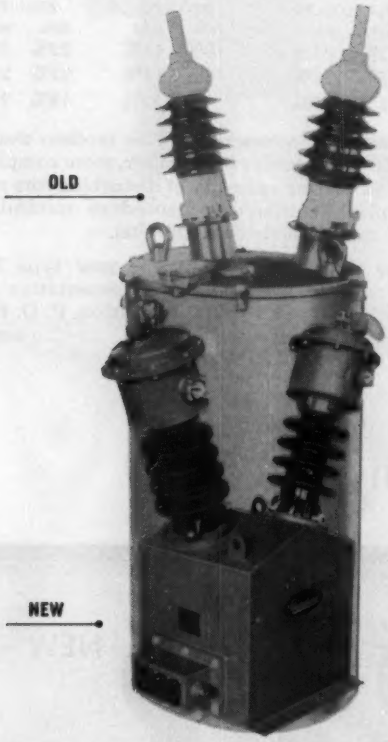


Width of Type LD is up to 37% less than superseded ratings of Type SL transformer—an important cost and spacesaving reduction.

OUTDOOR METERING TRANSFORMERS...

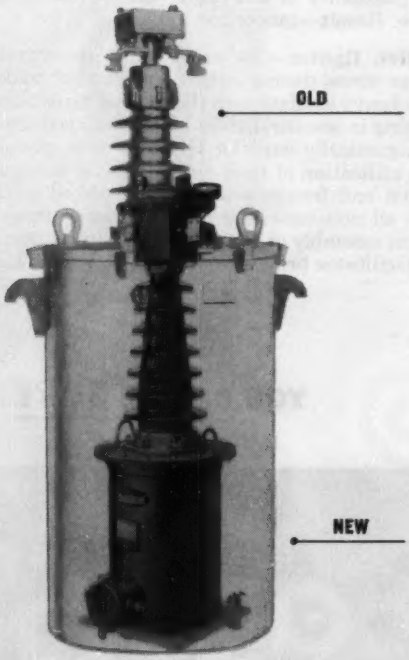
...accuracies within 0.3% at all ASA standard burdens

Standard Transformer's new line of completely redesigned outdoor metering transformers gives maximum accuracy on all metering applications. The vacuum impregnating process removes all traces of air from the heated core and assembly, resulting in the highest dielectric strengths. The new line conforms to all ASA, EEI and NEMA mounting and accuracy standards. These transformers are smaller and lighter than ever before. For specifications and certified dimension prints, see your nearby Standard Representative or write directly to us. You'll increase your accuracy where it counts most—ahead of and at the meter.



TYPE PXO OISC POTENTIAL TRANSFORMER

—outdoor type. Up to 69,000 volts primary; 120 volts secondary and secondary terminal box. Also available with single bushing for line to ground connection.



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2	1500	G.E.	34,400—2520, 3 Ph.
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3	75	Wag.	33,000—240/480
1	3000	A.C.	23,380—2580/4330Y, 3 Ph.
3	2000	A.C.	26,400/13,200—2390/4140
3	1250	G.E.	26,400/13,200—2400/4150
2	1500	G.E.	23,000—2400/4800, 3 Ph.
3	100	G.E.	22,000—7200/12470Y
3	50	G.E.	22,000—2300
3	1667	G.E.	13,800—600
1	600	Stand.	13,200—2300, 3 Ph.
1	450	Penna.	13,200—2400, 3 Ph. Askarel
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3	125	A.C.	6900—2300
3	100	G.E.	4800—120/240
3	50	Mol.	4160/7200—240/480
3	1500	G.E.	2300/4000—460
3	500	West.	2400/4160Y—240/480
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3	100	G.E.	2300/4000—230/460
1	100	G.E.	2300—575, 3 Ph.
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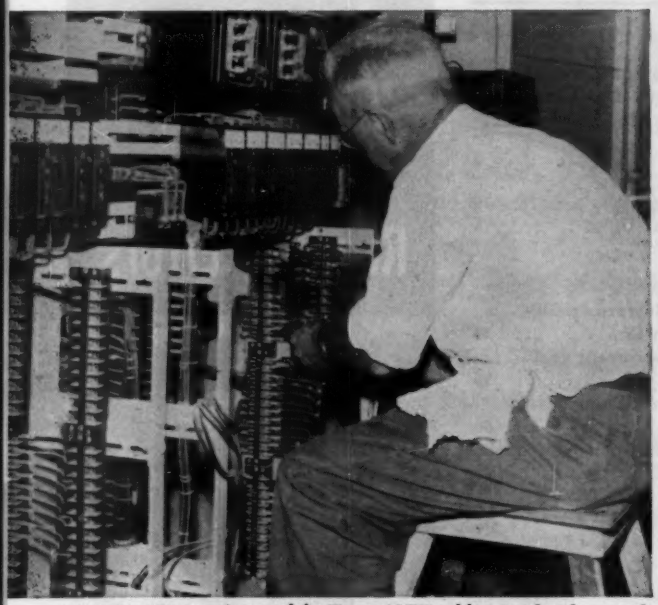

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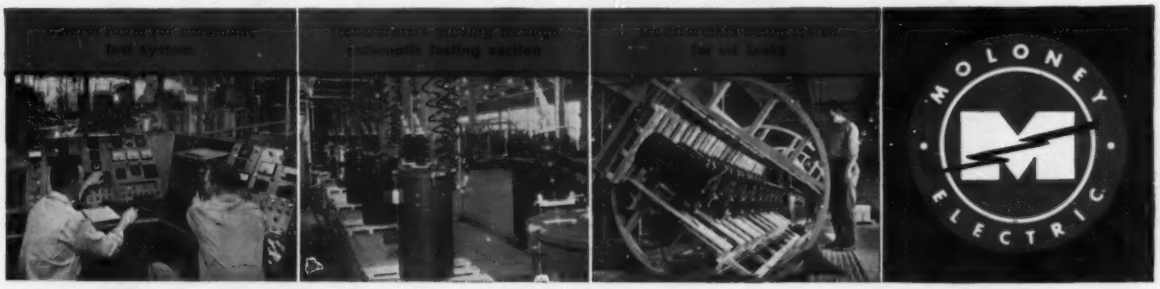

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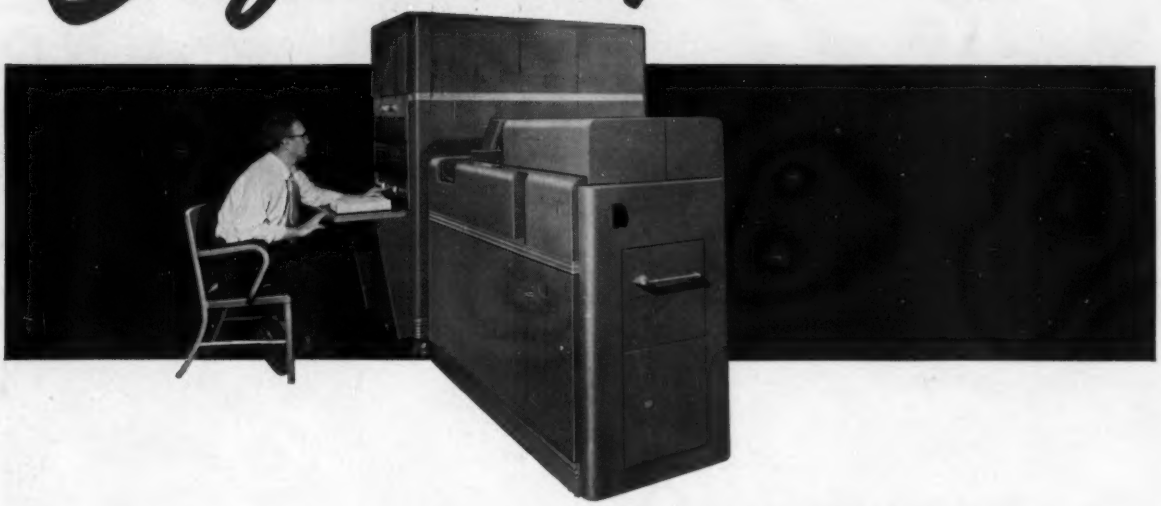

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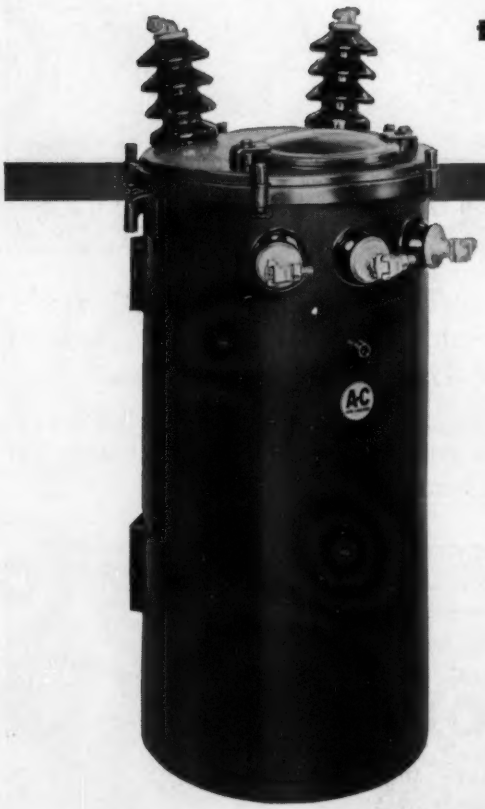

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